VERB REDUPLICATION IN MANDARIN CHINESE:

A COMPARISON BETWEEN THE AABB AND ABAB PATTERN

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ABSTRACT

This study addresses the differences in syntactic and semantic behaviour of two distinct verb reduplication patterns, AABB and ABAB in Mandarin Chinese. I propose that the surface orders of the two patterns are produced by contrasting syntactic structures. The structure for AABB is the result of copying each morpheme (A and B) and then combining them (AA+BB). The structure for the ABAB pattern represents the copying of a complex base AB. The reduplicant morpheme takes the spot of a verbal categorizer that is present in Mandarin Chinese verbs. This reduplicant morpheme attaches to a lower-level root node in the AABB reduplicative process, while it merges with a higher root in the case of the ABAB pattern.

Support for this proposal comes from an online experiment that investigated native speakers' perception and judgment of verb reduplication patterns. The experiment involved a grammaticality judgment task and a fill-in-the-blank task. One hundred and twenty test sentences were constructed containing verbs of each pattern. Eighty-five adult participants took part in the experiment.

This study revealed four primary findings, 1) the two patterns differ with respect to the separability where the AABB pattern allows the insertion of the conjunction *you* 'and' (**AA-*you*-BB,** e.g., *beng-beng-**you**-tiao-tiao*) while the ABAB pattern does not. 2) the two patterns differ in the ability to take a direct object, which accounts for the deverbalization property of AABB as reported in the literature (Qi, 2018). 3) the two patterns have distinct semantic interpretations. The AABB pattern expresses an intensified meaning while the ABAB pattern conveys attenuated meaning as reported in the literature (Arcodia et al., 2014; Melloni & Basciano, 2018). 4) the two patterns vary concerning the compatibility of the perfective marker *le*. It directly attaches at the end of the AABB pattern (**AABB-*le***, e.g., *jin-jin-chu-chu-**le***). It is inserted in the middle of the ABAB pattern (**AB-*le*-AB**, e.g., *da-sao-**le**-da-sao*) due to the semantic constraints of *le* which motivate the movement of the reduplicant morpheme to a phrasal node. The different behaviours thus support the suggested structures.

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LIST OF ABBREVIATIONS

ACC=accusative case

CL=classifier

COMPL=complement

ER=er-hua rimes

MP=modal particle

PREP=preposition

PROG=progressive aspect marker

RED=reduplicant morpheme

SFP=sentence-final particle

3SG=third person singular

CHAPTER 1 INTRODUCTION

Word reduplication is found in many languages in the world. The process of reduplication occurs when all or part of a word is repeated to convey different meanings. The term 'reduplicant' refers to the copied part of a word, whereas 'base' refers to the root that the reduplication process is applied to (McCarthy & Prince, 1995). The reduplicative meanings may range from highly typical semantic functions such as repetition, intensification to more abstract morpho-syntactic features (Urbanczyk, 2017). Repetition is one of the most common functions of reduplication found in many languages (1a). In Estonian, reduplication can express the ultimate intensity of property (1b). The phrase *'suur-suur maja'* is the same as 'very-very big house' instead of 'very big house'. Reduplication is also employed to realize grammatical functions such as plurality and tense/aspect. For example, In the Malay language, the phrase *'buku-buku'* expresses the plural meaning of 'books' (1c). The bikol phrase *'nag-ka~ka'on'* 'is eating' indicates a temporal change, i.e., present progressive tense as compared to its perfect tense form *'nag-ka'on'* 'have eaten' (Hurch & Mattes, 2007, p. 195).

1a. Mongolian: *bayn bayn* 'often, constantly'
Sundanese: *guguyon* 'to jest repeatedly' (*guyon* 'to jest')
Tzeltal: *-pikpik* 'to touch it lightly repeatedly' (*-pik* 'to touch it lightly')

(Regier, 1994, p. 4)

1b. suur-suur maja[1]
big-big house
'very very big house'

(Erelt, 2008, p. 269)

1c. buku-buku
book-book
'books'

(Nadarajan, 2006, p. 40)

Most languages have productive full and partial reduplication (Dryer & Haspelmath, 2013). For example, Hungarian has both full reduplication (2a); and partial reduplication (2b) where the

[1] Examples without citations are created by the author.

particle *fel* ‘up’ is treated as a subpart of a verb-particle unit. Mandarin Chinese is particularly productive in both full and partial reduplication (3a & 3b).

2a. már-már
yet-yet
‘almost

(Piechnik, 2015, p. 48)

2b. fel-fel dob egy labdát
UP-UP throw.3SG a ball.ACC
‘throw up a ball from time to time’
(‘throw up a ball to an extreme height’)

(Lipták, 2019, p. 552)

3a. tian-tian
day-day
‘every day’

3b. liang-shan-shan
bright-glittering-glittering
‘very shiny’

In Mandarin Chinese, multiple categories including nouns, adjectives, verbs, numerals, and so on can undergo reduplication of different patterns. Verb reduplication is especially common and frequent, and it has common patterns such as AA(4a), AAB(4b), ABAB(4c), AABB(4d), and ABAC(4e). The capital letters A, B, and C are used to represent component morpheme/syllables of a word. In Chinese, a one-to-one relationship exists between a morpheme and a syllable with only a few exceptions. *xi-ma-la-ya* (4f) has four syllables/characters which forms a single morpheme meaning ‘Himalaya’. Due to the limited number of these words, monomorphemic verbs with multiple syllables are excluded from the discussion.

4a. A-A
chang-chang
taste-taste
‘to taste a little bit’

4b. A-A-B
hui-hui-shou
wave-wave-hand
‘to wave hand(s)’

4c. A-B-A-B
gu-li-gu-li
inspire-stimulate-inspire-stimulate
‘to encourage a bit’

4d. A-A-B-B
shan-shan-jian-jian
delete-delete-cut-cut
‘to shorten multiple times’

4e. A-B-A-C
shi-hua-shi-shuo
honest-word-honest-speak
'to speak frankly'

4f. A-B-C-D
xi-ma-la-ya
'Himalaya'

1.1 Study Focus

This thesis is a study on the syntactic behaviours of verb reduplication, specifically the reduplication following the ABAB and AABB patterns. These two patterns are reduplicated from a base verb AB which consists of two syllables, e.g., *gu-li* 'to encourage' (3c) and *shan-jian 'to shorten (essay)'* (3d). Thus, verbs of the AB state such as *gu-li* and *shan-jian* are called disyllabic (also bimorphemic) verbs by Chinese scholars (Qi, 2018; Xiong, 2010). Disyllabic verbs are complex in structure, rich in meaning and diverse in usage. Empirically, the study of the two patterns (i.e., AABB and ABAB) has become the primary area of research topic in the study of disyllabic verb reduplication. However, few studies discuss the comparison of the two patterns from syntax-semantics perspectives. This paper will fill that gap and analyze the behaviour of verb reduplication with these two patterns by assessing the requirements on the base AB, the syntactic structures of reduplicative processes, and the semantic interpretations of the output.

I propose two distinct syntactic structures for the two patterns: (1) the AABB reduplication can be analyzed as combining two verbal constituents projected by each morpheme (AA+BB, e.g., *feng-feng-bu-bu*) and (2) the ABAB pattern is a result of copying the whole base (AB+AB, e.g., *xiu-xi-xiu-xi*).

This thesis consists of six chapters. Chapter one gives a brief introduction of reduplication in Mandarin and other languages and the focus of the study. Chapter two gives the literature review and discusses previous studies in morphology, syntax, semantics, and phonology addressing verb reduplication. It ends with outlining the proposed derivations of the two reduplication patterns and the hypotheses associated with them. Chapter three presents the research methodology, test sentences, and their purpose in testing. Chapter four reports the results of the experiment. Chapter five discusses the results and distinctions between the two patterns based on the experiment results. Chapter six concludes with the major findings of the study and provides some suggestions for future research.

CHAPTER 2 LITERATURE REVIEW

2.1 Morphological Requirements

In a disyllabic verb in Mandarin, each of the two syllables corresponds to a morpheme. Disyllabic verbs can be further divided into several subtypes according to the structural and/or semantic relationship between the two morphemes (Xiong, 2010). As illustrated in (5-10), we find i) a coordinate form with two morphemes in coordination, which can be a pair of synonyms (5a) or antonyms (5c); (ii) a verb-complement form with one morpheme as a complement[2] of the other morpheme (6a); (iii) a verb-affix form with one of the morphemes being an affix attaching to the other (7a); (iii) an attributive form with one morpheme as a modifier of another morpheme (8); (iv) a verb-object form with the second morpheme as the object of the first morpheme (9); (v) a subject-predicate form with one morpheme as the predicate of the other morpheme (10). A disyllabic verb can be formed by either two bound morphemes as in (5a); two free morphemes as in (5c); or one bound morpheme and one free morpheme as in (7a).

5a. shang-liang (coordinate form)
negotiate-consider
'to consult; to discuss'

5b. shang-liang-shang-liang
negotiate-consider-negotiate-consider
'to discuss a bit'

5c. lai-hui (coordinate form)
come-go
'to go back and forth'

5d. lai-lai-hui-hui
come-come-go-go
'to come and go repeatedly'

6a. tui-guang (verb-complement form)
push-wide
'to promote; to popularize'

6b. tui-guang-tui-guang
push-wide-push-wide
'to promote a bit'

(Xiong, 2010, p. 18)

7a. da-sao (verb-affix form)
prefix-sweep
'clean'

7b. da-sao-da-sao
prefix-sweep-prefix-sweep
'to clean up a bit'

8. hu-shan (attributive form)
suddenly-flash
'gleam'

(Xiong, 2010, p. 18)

[2] 'complement' here is a traditional terminology in Chinese grammar, which differs from the syntactic complement term. It can include adjuncts of any kind such as an adverbial modifier here.

9. dong-xin (verb-object form)
move-heart
'to be tempted'

(Xiong, 2010, p. 19)

10. lian-hong (subject-predicate form)
face-red
'blush'

(Xiong, 2010, p. 19)

A large number of disyllabic verbs can be reduplicated as the ABAB pattern whose base (i.e., the AB state) can have various structures (Deng, 2013; Sui, 2018; Wang, 2017; Xiong, 2010). For example, *shang-liang* in (5a) has a coordinate structure where its morphemes *shang* (A) and *liang* (B) denote similar meanings. This verb can be reduplicated as the ABAB pattern *shang-liang-shang-liang* as in (5b). Interestingly, the two morphemes of the base verb with a coordinated structure in the ABAB pattern are almost always a pair of synonyms and rarely antonyms. Other structures such as the verb-complement form and verb-affix form can be reduplicated as the ABAB pattern as well (6b & 7b). Disyllabic verbs of coordinated and verb-affix structures are the most common ones that are reduplicated as the ABAB pattern. Moreover, most coordinated compounds consist of two bound morphemes, such as in (5a) where *shang* 'negotiate' and *liang* 'consider' cannot stand alone by themselves. Disyllabic verbs of the verb-affix form are formed with at least one bound morpheme (i.e., the affix which attaches to the root). Therefore, the two morphemes of the base verb from the ABAB pattern are always bounded.

On the other hand, what distinguishes the two patterns is that in contrast to the ABAB pattern, there is not always a base verb deriving the AABB pattern. For example, the AABB phrase *zou-zou-kan-kan* 'to walk and look around' (11a) has no base verb *zou-kan* (11b). However, the word *zou-zou-kan-kan* is made from two verbs, i.e., *zou* 'walk' and *kan* 'look'. The two morphemes do exist by themselves as verbs in a sentence (11c & 11d). Even when the AABB reduplication has a proper base, the base verb always has a coordinated structure where the two morphemes have a semantic association (i.e., the two morphemes being a pair of synonyms or antonyms). No other structures of the base verb can be reduplicated in this pattern. These restrictions result in a relatively small number of verb reduplications of the AABB pattern

compared to the ABAB pattern. In fact, as many scholars have discussed, the AABB pattern is mostly associated with adjectives (12) (Arcodia et al., 2014; Sang-Im and Lee-Kim, 2016; Wang, 2017). The morphological requirements of the two patterns are summarized in Table 2.1 below.

11a. zou-zou-kan-kan
walk-walk-look-look
'walk and look around'

11b. *zou-kan
walk-look

11c. ta yi-jing zou-le.
He already leave-SFP[3]
'He already left.'

11d. ma-ma , wo ke-yi kan dian-shi ma?
mom I can watch TV MA[4]
'Mom, can I watch TV?'

12. ping-ping-dan-dan
ordinary-ordinary-insipid-insipid
'ordinary'

Table 2.1 Morphological requirements of AB, ABAB, and AABB

AB	ABAB	AABB
coordinate form verb-complement form verb-affix form attributive form verb-object form subject-predicate form	mostly coordinate form; a few other forms such as verb-complement form and verb-affix form	only coordinate form

2.2 Semantic Restrictions

The base verb AB of the ABAB pattern is usually an activity verb[5] (13a) denoting a lasting event (Arcodia et al., 2014; Deng, 2013). Achievement verbs are therefore excluded from discussion

[3] SFP=sentence-final particle
[4] MA=question marker
[5] The classification of eventuality of verbs (i.e., activity, accomplishment, achievement, stative) is based on Vendler (1957).

(13b) since they denote instantaneous or punctual events without duration (Rothstein, 2004; Vendler, 1957). Accomplishment verbs that are reduplicated as the ABAB pattern emphasize the activity portion of the event, not the resultative portion (Deng, 2013). For example, in the disyllabic verb *gai-shan* (13c), *gai* is a verb denoting 'to correct, amend, or improve', whereas *shan* is a final state being 'good or fine'. Reduplication *gai-shan-gai-shan* (13c) highlights the process of improvement instead of the result of being fine. A few stative verbs can also be reduplicated as the ABAB pattern, which highlights a state of psychological being (13d).

13a. shang-liang-shang-liang
negotiate-consider-negotiate-consider
'to discuss a bit'

13b. *jin-chu-jin-chu
enter-exit-enter-exit
'to enter and exit'

13c. gai-shan-gai-shan
correct-good-correct-good
'to improve'

13d. liao-jie-liao-jie
know-understand-know-understand
'to understand a little bit'

In contrast, no special aspectual requirements are imposed on the base of the AABB pattern. The AABB reduplication is found with all four types of verbs, i.e., activity verbs (14a), achievement verbs (14b), accomplishment verbs (14c), and stative verbs (14d). Similarly, a stative verb that is reduplicated as the AABB pattern also emphasizes a psychological state, and it often transforms into an adjective. The adjective-like quality of the AABB pattern will be discussed in more detail in Chapter 5.

14a. shan-shan-jian-jian
delete-delete-cut-cut
'to shorten multiple times'

14b. lai-lai-hui-hui
come-come-go-go
'to come and go repeatedly'

14c. chi-chi-he-he
eat-eat-drink-drink
'to wine and dine'

14d. ming-ming-bai-bai
clear-clear-white-white
'being crystal clear'

The two reduplicative patterns also differ in their interpretation. Verbs with the ABAB pattern adopt a feature of decreasing function, i.e., an attenuated semantic effect meaning 'to do something a bit' (Arcodia et al., 2014). In many contexts, 'a bit' is added at the end when translating ABAB reduplicated verbs (e.g., 13a & 13b above). This pattern also appears in

imperatives with a flavor of casualness (15a), or with an emphasis on politeness (15b) (Qi, 2018).

15a. zan-men yi-qi shang-liang-shang-liang.
we-plural together negotiate-consider-negotiate-consider
'Let's discuss a little bit together.'

15b. qing Li-jiao-shou zhi-dian-zhi-dian wo.
please professor Li guide-point-guide-point me
'Please give me a little guidance, professor Li.'

In contrast, verb reduplication of the AABB pattern usually indicates an increase of time or frequency of an event, i.e., an intensified semantic effect (Arcodia et al., 2014; Melloni & Basciano, 2018; Qi, 2018). For example, *shan-shan-jian-jian* in (14a) above is translated as 'to shorten multiple times', describing a situation where an essay is shortened an increasing number of times.

Verb reduplication in Chinese triggers event iteration. The ABAB pattern indicates homogeneous iterated activity, and the number of that activity must be small, or 'a little bit'; whereas the AABB pattern denotes the iterations that are not homogeneous (Deng, 2013), such as in the action of *jin-chu* 'enter and exit'. Because one part (i.e., AA) requires the other (i.e., BB). You need to enter in order to exit (16). The time of iterated events does not have to be short and can be numerous (Deng, 2013). In other words, one may enter and exit multiple times for five minutes, five hours, or even all day. The semantic effects of the two patterns are summarized below in Table 2.2.

16. jin-jin-chu-chu
enter-exit-enter-exit
'to enter and exit repeatedly'

Table 2.2 Summary of semantic effects (based on Arcodia et al., 2014; Deng, 2013)

	ABAB	AABB
base: activity verbs, and a few accomplishment verbs and stative verbs	√	
base: all aspectual classes		√
increasing meaning		√
decreasing meaning	√	
event-external iteration		√
event-internal iteration	√	
homogeneity in iteration	√	
heterogeneity in iteration		√

2.3 Syntactic Behaviour

2.3.1 Verbal Features

With respect to syntactic features, disyllabic verbs remain verbs after being reduplicated as the ABAB pattern (17).

17a. wo tai lei-le, xiang-yao xiu-xi wu fen-zhong.
I too tired-SFP want rest-rest five minute-clock
'I am too tired and want to rest for five minutes.'

17b. wo tai lai-le, xiang-yao xiu-xi-xiu-xi.
I too tired-SFP want-need rest-rest-rest-rest
'I am too tired and want to rest a little bit.'

However, verbs with the AABB pattern exhibit some degree of deverbalization and can be used as predicative adjectives (Qi, 2018; Zhang & Liu, 2008). This is common cross-linguistically. Adjectives derived from verbs may form intransitive predicates, such as in English *I can employ Jake.* vs *Jake is employable.* Therefore, deverbal adjectives used as predicates will always be intransitive predicates (Bach, 1986; Dowty, 1979). In Mandarin Chinese, the degree of deverbalization differs, with some verbs maintaining verbal features while others transform to adverbs and adjectives. For example, in (18a), the phrase *jin-jin-chu-chu* remains as a verb. In 18(b), the AB-base *ming-bai* is a stative verb. When reduplicated as the AABB pattern, the word is used as an adjective (18c) which expresses a state of being. Melloni and Basciano (2018) state

that almost all verbs with the AABB pattern can serve as adverbials with (18d) or without (18e) the preverbal modification marker *de*. Since verbs can be modified by adverbials and manner adverbs (i.e., *niu-niu-nie-nie-de* 'bashfully' and *tou-tou-mo-mo* 'furtively') are transformed from adjectives, this shows that reduplicated verbs with the AABB pattern indeed partially lose verbal features and become more adjectival.

18a. ren-qun jin-jin-chu-chu.
crowd enter-enter-exit-exit
'The crowd went in and out repeatedly.'

18b. wo ming-bai le.
I clear-white SFP.
'I see.'

18c. yi-qie dou ming-ming-bai-bai.
everything all clear-clear-white-white
'Everything is all crystal clear.'

18d. ta niu-niu-nie-nie-de xiao-le.
she twist-twist-pinch-pinch-de[6] smile-SFP
'She smiled bashfully.'

18e. bie tou-tou-mo-mo xiao.
not steal-steal-pilfer-pilfer laugh
'Don't laugh furtively.'

Another phenomenon found with the AABB pattern is that they lose the ability to take an object even when its pre-reduplicated base is transitive. Comparing (19a) and (19b), after reduplication, *feng-feng-bu-bu* is no longer compatible with the object 'clothes' and becomes intransitive. To some extent, this phenomenon is predicted by the deverbalization of the AABB pattern, which will disable transitivity due to the attenuated verbal features.

19a. ta zheng-zai feng-bu na-dui yi-shang.
She PROG sew-mend that-CL clothes
'She is mending those clothes.'

19b. *ta zheng-zai feng-feng-bu-bu na-jian yi-shang.
She PROG sew-sew-mend-mend that-CL clothes
'She is mending those clothes.'

[6] de= preverbal modification marker

While the ABAB pattern remains a verb after reduplication, it allows the attachment of an object, but with restrictions (Y. Li, 2002). For example, a quantitative object is rejected by the verb unless this object is modified by demonstratives. 20a shows that the object *liang-ge wen-ti* 'two problems' without a demonstrative pronoun is not compatible with the reduplicated verb. The object is allowed to attach to the verb when it is modified by *zhe-liang-ge* 'these two' (20b). It is also acceptable if the object has a reference as agent (Y. Li, 2002), such as in (20c).

20a.	*wo-men	tao-lun-tao-lun		liang-ge	wen-ti.
	I-plural	discuss-discuss-discuss-discuss		two-CL	problem
	'Let's discuss two problems a bit.'				
20b.	wo-men	tao-lun-tao-lun		**zhe**-liang-ge	wen-ti.
	I-plural	discuss-discuss-discuss-discuss		this-two-CL	problem
	'Let's discuss these two problems a bit.'				
20c.	wo-men	tao-lun-tao-lun	**ta**	ti-chu-de	liang-ge
	I-plural	discuss-discuss-discuss-discuss	he	proposed	two-CL
	wen-ti.				
	problem				
	'Let's discuss the two problems proposed by him.'				

2.3.2 Modification/Insertion

Verbs can be modified by different adverbs in Chinese, which contrasts the two patterns. The ABAB pattern allows the modification by manner adverbs such as *zi-xi-de* 'carefully' (21a), but this is not always acceptable for the AABB pattern as shown in (21b) and (21c) below. Adverbs of frequency and time are also limited in their ability to modify both patterns. The AABB pattern matches a high frequency such as 'often' (22a) or longer duration, e.g., 'the whole morning' (22b), while the ABAB pattern cannot (22c & 22d) (Deng, 2013).

21a.	wo	hui	zi-xi-de	diao-cha-diao-cha.
	I	will	carefully-de	investigate-examine-investigate-examine
	'I will investigate (the event) carefully.'			
21b.	*wo	hui	zi-xi-de	feng-feng-bu-bu.
	I	will	carefully-de	sew-sew-men-mend
	'I will sew and mend carefully.'			
21c.	ta	kuai-le-de	beng-beng-tiao-tiao.	
	he	happily-de	skip-skip-jump-jump	
	'He skipped around happily.'			

22a. ta zong-shi beng-beng-tiao-tiao.
He often skip-skip-jump-jump
'He often skips around.'

22b. ta beng-beng-tiao-tiao yi-shang-wu.
he skip-skip-jump-jump one-morning
'He skipped and jumped around the whole morning.'

22e. *wo-men zong-shi tao-lun-tao-lun zhe-ge wen-ti.
I-plural often discuss-discuss-discuss-discuss this-CL problem
'We often discuss this problem.'

22f. *wo-men tao-lun-tao-lun zhe-ge wen-ti yi-shang-wu.
I-plural discuss-discuss-discuss-discuss this-CL problem one-morning
'We discuss this problem the whole morning.'

Apart from the modification by adverbs, the two patterns are also different with respect to the insertion of the perfective marker *le* (Deng, 2013; Melloni & Basciano, 2018; Sang-Im & Lee-Kim, 2016). AABB does not allow the insertion of the perfective marker *le* between AA and BB (23a) but attachment at the end of the pattern (23b). The ABAB pattern, on the other hand, tolerates both the attachment of *le* in the middle and at the end, but with different semantic interpretations (23c) shows the insertion of *le*, which indicates that the event happened in the past. The attachment of *le* in (23d) is, in fact, not a perfective marker but a sentence-final particle, which does not indicate a past tense meaning here (Soh & Gao, 2006). The difference between the perfective marker *le* and the sentence-final *le* will be discussed in Chapter 5.

23a. *hai-zi-men beng-beng-le-tiao-tiao yi shang-wu
child-suffix-plural skip-skip-LE[7]-jump-jump one morning
'Children skipped and jumped the whole morning.'

23b. hai-zi-men beng-beng-tiao-tiao-le yi shang-wu.
child-suffix-plural skip-skip-jump-jump-LE one morning
'Children skipped and jumped the whole morning.'

23c. ta da-sao-le-da-sao zhe-ge fang-jian.
she prefix-clean-LE-prefix-clean this-CL room
'She cleaned the room a bit.'

[7] LE=perfective marker *le*

23d. ni ying-gai xiu-xiu-xiu-xi-le.
you should rest-rest-rest-rest-SFP
'You should take a little rest.'

Another phenomenon that may contrast the two reduplication patterns is rhotacization, where a retroflex liquid /ɹ/ <r> is attached to a word. The /ɹ/ sound is added at the end of the AABB pattern (i.e., AABB-*er*) while it attaches to the first B and the second B in the ABAB pattern (i.e., AB-*er*-AB-*er*). One might argue that this could be another aspect that distinguishes the two patterns, but rhotacization is very subjective to regional preferences (Lee, 2007). Most Chinese, except for people from small areas in Northeastern China (Pankhurst, 2012), do not insert/add *'er'* to both patterns. Thus, it is excluded from discussion in this study.

2.4 Reduplication and Compounding

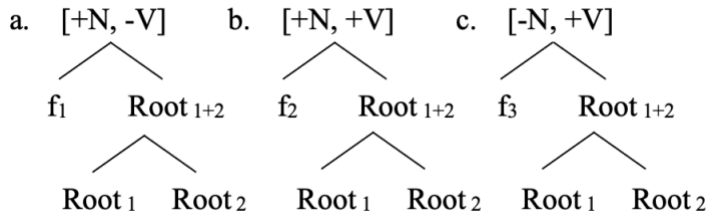
Traditionally, compounding in English refers, almost exclusively, to the combination of free roots. In Chinese, a great portion of compounds is formed with bound roots. For example, *zhao-xiang-ji* 'camera' is a compound noun made up of three bound roots. As mentioned in previous sections, many disyllabic verbs are made up of bound morphemes, and such verbs are viewed as compounds in Mandarin. Much of the modern word formation in Chinese is still derived from bound roots. In fact, as long as the purpose of compounding is to produce and create new words, there is no distinction between Mandarin root compounding and English free root compounding (Sproat & Shih, 1996).

Reduplication is also often seen as a process of compounding. Guo (1987) and Hu (2006) argue that reduplication of the AABB pattern is a compounding process where AA and BB are adjoined together instead of just doubling the sounds of the base. Sui (2018) also proposes that the AABB pattern with increasing function, i.e., an intensifying reduplication, is compounding. Zhang (2007), within the framework of Distributed Morphology (Halle & Marantz, 1993, 1994; Harley & Noyer, 1999, 2003; Marantz, 1997), demonstrates that compounding in Mandarin Chinese is a result of the merger of category-less roots. In English, a noun as the complement of a verb forms a verb phrase, e.g., 'eat food'; an adjective that modifies a noun forms a noun phrase such as 'beautiful flowers'. However, in Chinese, a verb and a noun may form a nominal compound (24a), and an adjective and a noun may form an adjective (24b). To account for this phenomenon, she argues that Mandarin employs a type of root compounding.

24a.	zhi-ji	24b.	zhong-xin
	know-self		loyal-heart
	'soul mate'		'faithful'

Figure 2.1 below shows how this mechanism works. A root has no category and is free to combine with another root to form an advanced root, i.e., '$Root_{1+2}$'. This higher root is then merged with a categorizer represented by a functional head '$f_{1/2/3}$' to receive a syntactic category. Structure (a), (b), and (c) illustrate the compounding of a noun, adjective, and verb, respectively. For example, (24b) can be analyzed with structure (b). $Root_1$ *zhong* 'loyal' combines with $Root_2$ *xin* 'heart' to form a new $Root_{1+2}$ *zhong-xin*. When the root *zhong-xin* is attached to the functional head f_2, it receives an adjectival category, represented by [+N, +V].[8]

Figure 2.1 Root compounding in Mandarin



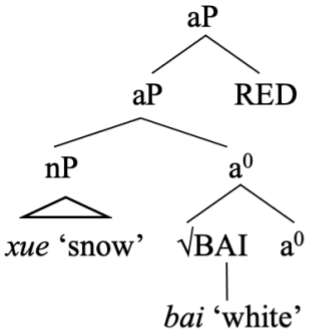
Zhang (2007, p. 177)

Sang-Im and Lee-Kim (2016) adopt this idea of a 'higher root' and propose two internal structures for subordinate and coordinate compounds in adjective reduplication (Figure 2.2).

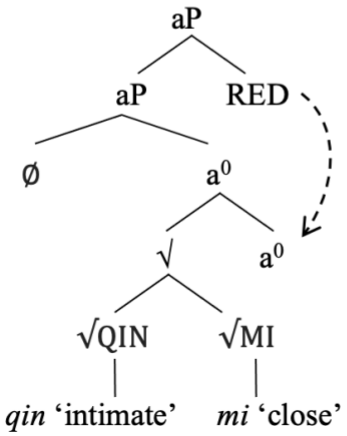
[8] In Chinese grammar, adjectives pattern with nouns and at the same time show partial features of verbs. Therefore, an adjective has +N, +V features.

Figure 2.2 Structure of adjective reduplication

a. AABB: Subordinate compound with RED



b. ABAB: Coordinate compound with RED



based on Sang-Im and Lee-Kim (2016, p. 9)

In structure (a), the base *xue-bai* is seen as a full-fledged word with a modifier-head structure; while in (b), two roots (represented by ‘√’) *qin* and *mi* in an equal position form a higher root (i.e., the base *qin-mi*) which then merges with a functional head a^0. A reduplicant (represented by ‘RED’) is analyzed as adjoining to a phrasal level node for both compounds. For a subordinate compound (structure a), the second AB, i.e., the reduplicant, is the sister of the base, and hence an ABAB pattern (25a); while for coordinate compounds (structure b), two more operations need to be fulfilled: (1) morpheme lowering, which brings the reduplicant to a root node (represented by ‘a^0’); and (2) morpheme copying, which leads to an equal distribution of the reduplicant AB to both heads, hence the AABB pattern (25b). This way, a disyllabic adjective of the subordinate structure

is always reduplicated as the ABAB pattern, while a coordinated adjective is always associated with the AABB pattern.

25a.	AB-RED A-B-A-B xue-bai-xue-bai snow-white-snow-white 'white (like snow)'	25b.	A-RED-B-RED A-A-B-B qin-qin-mi-mi intimate-intimate-close-close 'close'

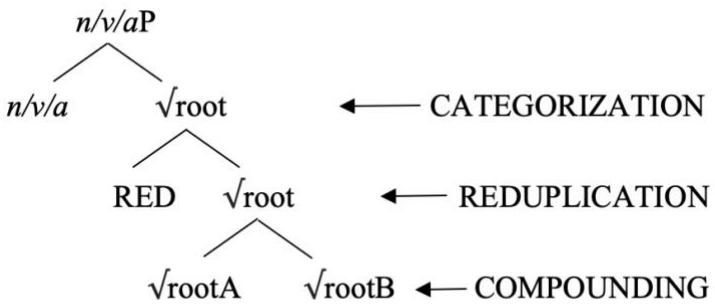
Sang-Im and Lee-Kim (2016, p. 6)

Although the proposal above accounts for the reduplicative behaviour of adjectives, it faces several problems. First, it does not explain why the RED morpheme attaches to a phrasal level node for the subordinate adjectives but instead a root level node for the coordinate adjectives. Second, according to Sang-Im and Lee-Kim (2016), morpheme lowering does not lead to any semantic interpretation contrasts in the logical form. However, morpheme lowering in Mandarin reduplication is overt movement since it is overt in the phonological form, i.e., it can be heard in the surface order A-A-B-B as a reflex of the morpheme lowering movement. Overt movement happens before spell-out and therefore is supposed to cause semantic effects on the surface. But the motivation and the semantic effects of such a movement are not clearly explained. Third, the proposed structures apply to adjectives but not necessarily to verbs. According to structure (b), a coordinate compound is always reduplicated as the AABB pattern. However, as mentioned previously (see Section 2.1), disyllabic verbs of a coordinated structure can be reduplicated as the ABAB pattern. These problems and contradictions suggest that alternative structures are needed to account for verb reduplication.

Melloni and Basciano (2018) propose a different structure when analyzing the increasing function of the AABB pattern for verbs, adjectives, and nouns (see Figure 2.3 below). The root A and root B are combined as a higher root, which merges with the reduplicant morpheme. RED contains the iterative meaning cross-categorially and acts as a modifier of the category-less root. The operation of attaching RED results in semantic intensification after reduplication and this applies to nouns, verbs, as well as adjectives (i.e., represented by *n/v/a*). The authors thus argue that the AABB reduplication should be analyzed as [A[AB]B] instead of [AA][BB] because the reduplication of monosyllabic verbs (i.e., the AA pattern) supposedly expresses a decreased meaning, which is contradictory to the increasing function of the AABB pattern. However, what

they cannot account for is why the RED 'AB' is inserted between the base AB to produce the order AABB but does not attach to the left or to the right of the base, which would otherwise produce the order ABAB.

Figure 2.3 The structure of the AABB pattern of nouns, verbs, and adjectives



(Melloni & Basciano, 2018, p. 356)

Holmberga and Wang (2018) show that in traditional Xining Chinese[9] (TXC), free common nouns undergo obligatory reduplication (Figure 2.4). They argue that the categorizer of a common noun in TXC always copies phonological traits of the root and hence causes obligatory reduplication. This way, a content word *fo-fo* 'spoon' is made of minimally two constituents; the base *fo* and its reduplicant *fo*.

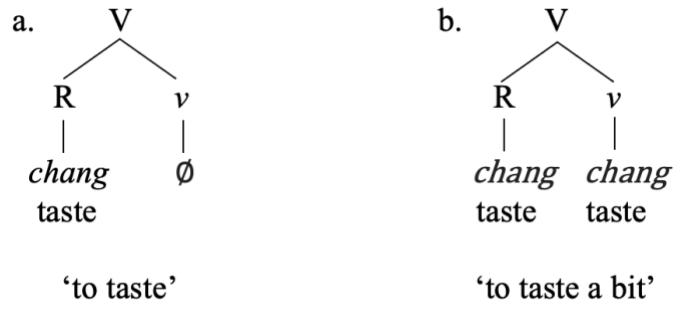
Figure 2.4 Obligatory reduplication of nouns in TXC

(Holmberga & Wang, 2018, p. 187)

[9] Xining Chinese is a dialect spoken in the capital city of Qinghai province Xining in Western China.

The difference between TXC and Mandarin is that for Mandarin, the two constituents are not necessarily overt. In other words, the categorizer of a content word is a null morpheme, which creates the spot for optional reduplication (Figure 2.5). For example, a content word *chang* 'to taste' is made of two constituents, i.e., a root and a categorizer which is represented by a null morpheme 'Ø'. An alternative structure is when the null morpheme is replaced by a reduplicant *chang*. I base my analysis of the verbal reduplication patterns on this proposal (see Section 2.7)

Figure 2.5 Optional reduplication in Mandarin



2.5 Reduplication as a Syntactic Process

Although reduplication has been studied in the context of phonological and morphological processes, many have found the connection to syntax. Travis (2001, 2003) argues that phonological reduplication is essentially syntactic reduplication in that phonological behaviours can be predicted by syntactic structures. Likewise, when observing adjectival reduplication in Mandarin, Sang-Im and Lee-Kim (2016) find that phonological asymmetries between coordinated compounds and subordinated compounds can be attributed to their distinct reduplicative structures. As a consequence, the second syllable of the AABB pattern (i.e., A[A]BB) is always weakened relative to that in the ABAB pattern. By 'weakened', they mean that the tone of the second morpheme is neutralized compared to its original pronunciation. There are four tones in Mandarin Chinese, i.e., the 1st tone 'flat tone', the 2nd tone 'rising tone', the 3rd tone 'falling then rising tone', and the 4th tone 'falling tone'. A neutral tone is often marked with 0. It means the sound is produced lightly and shorter. For example, mā with the first tone means 'mom'; má with the second tone means 'numb'; mǎ with the third tone means 'horse'; mà with the fourth tone means 'scold'; and ma with a neutral tone is a question marker which appears at the end of a question.

Analyzing reduplication as a purely phonological phenomenon fails to explain why there are syntactic constraints on the input (e.g., structural requirements of the base) and the output as well (e.g., deverbalization of the AABB pattern). A purely phonological process pf reduplication does not sufficiently address the distinct semantic contents of the two patterns, such as the semantic requirements of the input (e.g., achievement verbs cannot be reduplicated as the ABAB pattern) as well as the output (e.g., the decreasing/increasing function).

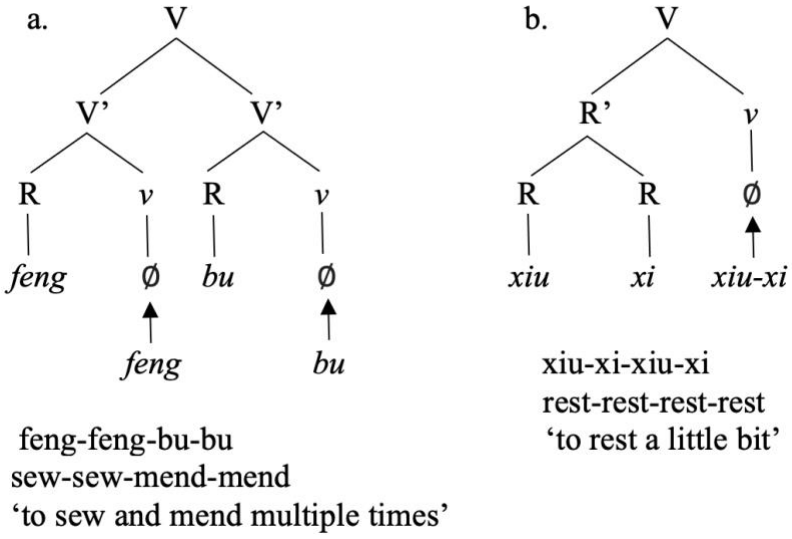
2.6 Summary

To summarize, the research on Mandarin reduplication has addressed reduplicative patterns, conditions, grammatical functions, and semantic meanings across categories. Additionally, Mandarin reduplication, often seen as a special kind of compounding, has been studied in many fields, especially morphology and phonology. However, prosodic constraints are not sufficient to explain Mandarin reduplicative behaviour. So far, not much research has addressed the inner syntactic structure of Mandarin reduplicative processes, especially of the verb category. Moreover, reduplicative structures of other categories such as nouns and adjectives proposed in some studies are not necessarily applicable for verbs, as illustrated in section 2.4. With respect to the research methodology, very little evidence is drawn from experimental results for the analysis of the two reduplicative patterns, AABB and ABAB. These gaps are addressed in this study on the syntactic behaviour of disyllabic verb reduplication employing experimental research methods and perspectives.

2.7 Hypotheses

As demonstrated in Sang-Im and Lee-Kim (2016), a disyllabic adjective of the subordinate structure is always reduplicated as the ABAB pattern, while a coordinated adjective is associated with the AABB pattern. Similarly, syntactic structures of verb reduplication differ by pattern as well. By observing the difference between the AABB and ABAB patterns, it can be found that the AABB pattern is a result of copying each morpheme while the ABAB pattern is a result of copying the whole base. Thus, two patterns should have distinct reduplicative structures. Following the proposal that the null categorizer provides the spot for reduplication (Holmberga & Wang, 2018), I propose two syntactic structures for verb reduplication of the two patterns, AABB and ABAB, as illustrated in Figure 2.6.

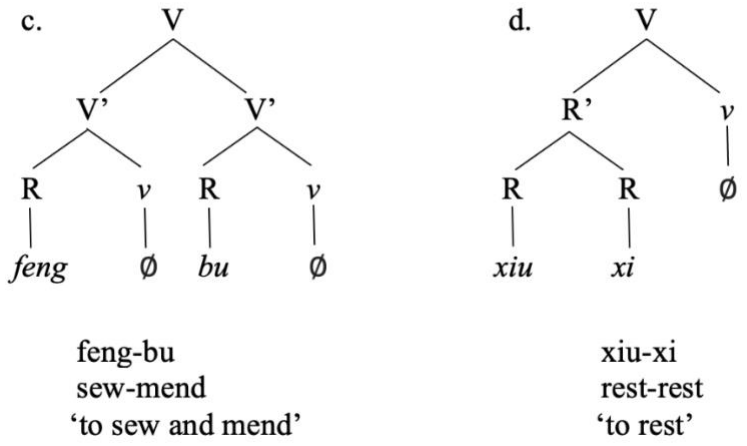
Figure 2.6 Syntactic structures of verb reduplication (AABB and ABAB)



In structure (a), each root projects the phrasal category of its own (i.e., V') by merging with a null categorizer *v* which accordingly creates a spot for reduplication. For example, the lower root *feng* is attached to a categorizer *v* to form a verb V', and so does *bu*. The null morpheme is replaced by a reduplicant morpheme as indicated by an arrow, which will produce two verbal components *feng-feng* and *bu-bu*. Then the two verbal phrases make up the final expression *feng-feng-bu-bu*. In structure (b), two roots *xiu* and *xi* are combined to form a higher root R' *xiu-xi*, which then merges with a null verb categorizer *v*. The null categorizer creates a spot for the RED morpheme. The reduplication, in this case, is regarded as copying the higher root R'. Also, root merging is a syntactic operation before the split of phonological form (PF) and logical form (LF) (Chomsky, 1993). Because the null categorizer as proposed in Distributed Morphology is pronounced when we have reduplication. Therefore, syntactic operations of attaching RED will cause semantic interpretations at the LF-interface. It has been discussed by many scholars that RED contains plural meaning and causes semantic iteration (Deng, 2013; Melloni & Basciano, 2018; Sang-Im & Lee-Kim, 2016). Since for both the AABB and ABAB patterns, RED merges with a root level node base, the semantic interpretation of plurality and iteration would be expected at LF for both the patterns. However, the frequency of iteration seems to depend on the base. The difference is that AABB creates a high frequency of iteration while the ABAB pattern tends to limit that frequency.

Chinese has very few inflectional/derivational markers to form a new word. Based on Distributive Morphology (Marantz, 1997), a word is constituted by one or several roots. In the case of Mandarin Chinese, about 70% of roots are bound, according to Packard (2000). For example, in structure (b), *xiu-xi* consists of two bound roots *xiu* and *xi*, which cannot be separated in order to express the meaning 'to rest'. This is the other structural reason why the proposed structure for the ABAB pattern requires the roots to merge first before merging with the categorizer *v*. On the other hand, root merging with a categorizer also meets the requirements of 'optional reduplication' in Mandarin, as proposed by Holmberga and Wang (2018). In other words, when there is no reduplication, the assumed structures in Figure 2.6 should be able to account for the structure of a base verb. This is demonstrated by Figure 2.7 below.

Figure 2.7 Syntactic structures of the base verb by patterns



feng-bu
sew-mend
'to sew and mend'

xiu-xi
rest-rest
'to rest'

For the base verb AB of the AABB pattern (structure c), each root merges with a verbal categorizer represented with a null morpheme, resulting in an intermediate constituent V'. The two constituents, i.e., two verbs *feng* and *bu*, form a final verb *feng-bu*. An optional reduplication is established when the null morphemes are replaced by reduplicant morphemes, as illustrated by the AABB reduplicative process in structure (a) of Figure 2.6 above. For the base verb AB of the ABAB pattern (structure d), the two bound roots form a free root R' first, which then attaches with a categorizer to get a syntactic category. ABAB reduplication happens when the reduplicant morpheme, i.e., *xiu-xi*, takes the spot of the originally null morpheme. This corresponds to the ABAB reduplicative process in structure (b) of Figure 2.6 above.

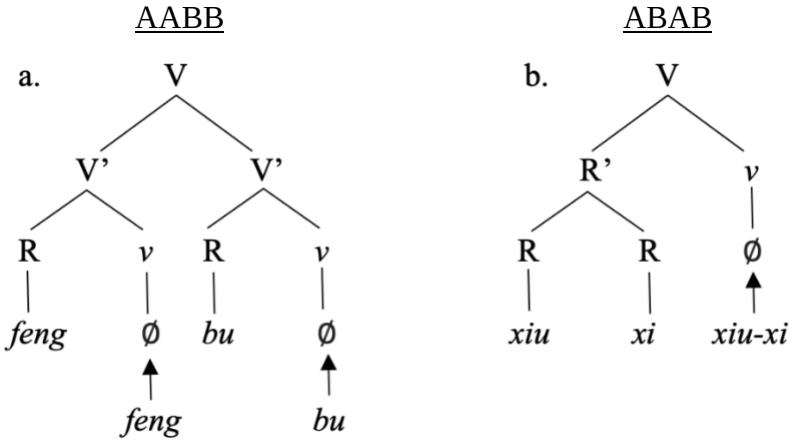
To summarize, the proposed structures for the two patterns rely on root merging. In the case of the ABAB pattern, two bound roots need to adjoin first to form a base AB and then merge with RED to produce the surface order ABAB. Whereases the base of the AABB pattern consists of two free roots which do not need to merge first. Instead, they project two verbs (AA and BB) first and then form a final state of verb AABB.

CHAPTER 3 METHODOLOGY

3.1 Research Purpose

This study investigates the reduplication of disyllabic verbs in Mandarin and tries to account for the syntactic processes of two verbal reduplication patterns, AABB and ABAB. The proposal is based on the two syntactic structures shown in Figure 3.1 below. The AABB pattern (26a) is derived as the combination of AA and BB where each reduplicant morpheme attaches to a lower root replacing the null verbalizer. The ABAB reduplication (26b) is treated as copying the whole base consisting of two lower roots forming a higher root. These structures make several predictions as to the behaviour of these patterns. An online experiment containing test questions was designed aiming to provide empirical evidence for these predictions. I will elaborate on them in the following sections.

Figure 3.1 Proposed structures for the two patterns



26a. feng-feng-bu-bu
sew-sew-mend-mend
'to sew and mend multiple times'

26b. xiu-xi-xiu-xi
rest-rest-rest-rest
'to rest a little bit'

3.2 Test Questions

3.2.1 Questions Regarding Structural Properties

To verify the proposed structures of the two patterns, several tasks were conducted to test participants' perception of Chinese verb reduplication. According to the inner structure of the AABB pattern shown in Figure 3.1a), each root projects the phrasal category of its own. This

predicts that both AA and BB can exist independently from each other and thus should be separable. Therefore, *feng-feng* or *bu-bu* is an intermediate constituent that can be used alone. On the other hand, the reduplicative structure of the ABAB pattern predicts that ABAB should be viewed as a whole and cannot be separated since AB forms only a root. In other words, *xiu-xi-xiu-xi* cannot be separated. Several questions are taken into consideration to construct test sentences to test these predictions.

(1) Can AA or BB from the AABB pattern stand alone as a verb? Or does verb reduplication of AA or BB make sense?

If yes, verbs of the AABB pattern can be separated. If not, AABB is better viewed as a whole word, and the proposed structure in Figure 3.1a) should be revised. For example, can *feng-feng* or *bu-bu* taken from the word *feng-feng-bu-bu* be used alone in a sentence as a verb? Two sentences (27a&b) were constructed based on this question. Twelve reduplicative words of the AABB pattern were selected to test this question, making up 12 pairs of sentences (24 sentences in total). Participants were asked to read these sentences and judge their acceptability.

27a.	zhe-tiao	po	niu-zai-ku	feng-feng	ke-yi	ji-xu	chuan.
	This-CL	ripped	jeans	sew-sew	can	continue	wear
	'This pair of ripped jeans can be worn again after sewing.'						

27b.	ma-ma,	bang	wo	bu-bu	zhe-shuang	wa-zi.
	Mom	help	me	mend-mend	this-CL	socks
	'Mom, help me mend this pair of socks.'					

(2) Can AB from the ABAB pattern stand alone as a verb?

This question does not need to be tested because the word level AB as the original base verb of the ABAB pattern is naturally freestanding. However, the root level AB is not separable from RED-AB according to the assumed structure in Figure 3.1b)

(3) Is the insertion of *you* 'and' between AA and BB (i.e., AA-*you*-BB) acceptable?

The base of the AABB pattern should always have a coordinated structure, which means the two morphemes are either a pair of synonyms or antonyms. Therefore, the two intermediate constituents V', i.e., the verbal category projected by each root in the AABB pattern, are at the

same level. Conjunctions connect two identical phrases on the same level. Based on this, the two morphemes of the AABB pattern, if separable, would allow the insertion of conjunction to conjoin constituents of the same level and type. This provides support for the structure that takes AA and BB to be two separate verbs.

In Mandarin Chinese, there are many conjunctions that can be roughly translated as 'and', such as *he*, *tong*, *gong*, *yu*, etc. The reason for choosing *you* instead of any other conjunctions in this test lies in several facts. First of all, *you* can indicate the repetition and continuation of actions and behaviours. For example, in (28a), *beng-beng-you-tiao-tiao* 'skip-skip-and-jump-jump' describes a situation where children skip and jump at the park. *you* 'and' indicates that the two activities (i.e., skip and jump) do not take place at the same time but in sequence and that there is an iteration of such actions. If replacing *you* with another conjunction, e.g., *he*, the sentence (28b) will be ungrammatical since the form AA-*he*-BB does not convey the meaning of sequence and iteration of the actions. Second, *you* can connect two contradictory actions, such as in sentence (28c), where the action of breaking up is conjoined with the action of getting back together. Again, the replacement of *you* with *he* will produce an ungrammatical sentence (28d) since one cannot end and restart a relationship at the same time. Therefore, it is optimal to choose *you* 'and' in the test, making sure that participants' responses would not be affected by inappropriate conjunctions and only judge the separability of the pattern.

28a. hai-zi-men zai gong-yuan li beng-beng-***you***-tiao-tiao.
child-plural PREP park inside skip-skip-and-jump-jump
'Children skip and jump at the park.'

28b. *hai-zi-men zai gong-yuan li beng-beng-***he***-tiao-tiao.
child-plural PREP park inside skip-skip-and-jump-jump
'Children skip and jump at the park.'

28c. na-dui qing-lv zong-shi fen-fen-***you***-he-he.
that-CL couple always separate-separate-and-reconcile-reconcile
'That couple break up and then get back over and over.'

28d. na-dui qing-lv zong-shi fen-fen-***he***-he-he.
that-CL couple always separate-separate-and-reconcile-reconcile
'That couple break up and then get back over and over.'

If the answer to the question is yes, the structure for AABB reflects the separability. If not, AABB is better viewed as a whole word. For example, can *you* 'and' be inserted into the middle

of the word *beng-beng-tiao-tiao*? The sample sentence (29) was constructed based on this consideration.

29.	hai-zi-men	zai	gong-yuan	li	beng-beng-**you**-tiao-tiao.
	Children-plural	at	park	inside	skip-skip-**and**-jump-jump
	'Children skip and jump at the park.'				

(4) Is the insertion of *you* 'and' between ABAB (i.e., AB-*you*-AB) acceptable?

The ABAB pattern was also tested with respect to the insertion of the conjunction *you* 'and'. If the insertion of *you* 'and' is allowed, verbs of the ABAB pattern can be separated from the middle and the structure proposed in Figure 3.1b) should be revised. If not, ABAB is better viewed as a whole word. For example, can *you* 'and' be inserted into the middle of the word *zhi-dian-zhi-dian*? 12 selected words of the ABAB pattern were used to construct 12 test sentence pairs (30).

30.	qing	zhi-dian-you-zhi-dian	wo.
	please	point-guide-and-point-guide	me
	'Please enlighten me.'		

(5) Is the perfective marker *le* (inserted in the middle/attached to the end) compatible with the two patterns?

As mentioned in Chapter 2, many studies have found that the two patterns are different concerning the insertion/attachment of the perfective marker *le* (Deng, 2013; Melloni & Basciano, 2018; Sang-Im & Lee-Kim, 2016). Based on the hypothesis, the insertion of *le* into the middle of the AABB pattern is supposed to be acceptable if AA and BB can be separated. In contrast, ABAB viewed as a whole word should not tolerate the insertion of *le*. A fill-in-the-blank test was developed to investigate in which position participants can put the perfective marker *le*. For example, in sentence (31a), two blanks are added (with one added after the second morpheme *feng* and the other after the fourth morpheme *bu*) in the field of the AABB word *feng-feng-bu-bu*. Participants would read the sentence and consider in which blank they would insert the perfective marker *le*. The first blank in the middle of the word corresponds to the acceptability of the **insertion** of *le,* while the second blank means the **attachment** of *le* at the end

of the word. Sentence (31b) is a sample sentence constructed for the AABB test in the same way. If the insertion of *le* is allowed, verbs of the AABB/ABAB pattern can be separated from the middle. If the attachment of *le* is allowed, verbs of the AABB/ABAB pattern are better viewed as a whole word. If neither the insertion nor attachment of *le* is allowed, verbs of the AABB/ABAB pattern are not compatible with the perfective marker. Twelve words of each pattern were chosen to construct sentences, making up 24 sentences in total.

31a. ta feng-feng__bu-bu__ yi bei-zi.
she sew-sew-mend-mend one life-suffix
'She sewed and mended the whole lifetime.'

31b. wo-men tao-lun__tao-lun__ zhe-ge wen-ti.
I-plural discuss-discuss-discuss-discuss this-CL problem
'We discussed this problem a bit.'

3.2.2 Questions Regarding 'Deverbalization'

Apart from testing the separability of the two patterns, the syntactic property of 'deverbalization' was tested as well. AABB is supposed to lose the ability to take an object while ABAB is not. Transitive verbs are here treated as prototypical verbs on a continuum, while intransitive or stative verbs are treated as "less verbal". Since only transitive base verbs can be used for this test, intransitive verbs are excluded from the discussion here. Two questions were designed to develop test sentences.

(1) Can AABB (with a transitive base verb) take any object?

If yes, verbs of the AABB pattern maintain verbal features; if not, verbs of this pattern are deverbalized to some extent. For example, can *feng-feng-bu-bu* appear along with the object 'dress'? A sample sentence is shown in (32). Twelve words of the AABB pattern were selected, which constructed twelve sentences.

32. wo feng-feng-bu-bu zhe-tiao qun-zi.
I sew-sew-mend-mend this-CL dress
'I sew and mend this dress.'

(2) Can ABAB (with a transitive base verb) take any object?

If yes, verbs of the ABAB pattern maintain verbal features; if no, verbs of this pattern are deverbalized to some extent. For example, can *tao-lun-tao-lun* appear along with the object 'problem'? Participants would read the sentence below (33) and judge whether it is acceptable. Again, 12 words of the ABAB pattern were chosen to construct test sentences.

33.	wo-men	tao-lun-tao-lun	zhe-ge	wen-ti	ba.
	We-plural	discuss-discuss-discuss-discuss	this-CL	problem	MP
	'Let's discuss this problem a bit.'				

3.2.3 Questions Regarding the Decreasing/Increasing Function

As one of the most salient features, verb reduplication leads to semantic changes of the output. The ABAB pattern exhibits the decreasing function meaning 'to do something a little bit'. Hence, it is not compatible with adverbs of large numbers or frequency such as *hen-duo-ci* 'many times'. On the other hand, the AABB pattern expresses intensified meaning and therefore does not match adverbs of small numbers or frequency such as *liang-ci* 'two times'. Questions based on this semantic aspect are listed below. Twelve words of each pattern were selected to construct test sentences.

(1) Is AABB compatible with 'two times'?

If yes, verbs of the AABB pattern do not exhibit increasing meaning since they are compatible with small frequency; if not, verbs of the AABB pattern exhibit increasing meaning. For example, is *jin-jin-chu-chu* compatible with 'two times'?

34.	wo	kan-jian	ta	jin-jin-chu-chu	liang-ci.
	I	see	him	enter-enter-exit-exit	two times
	'I see him enter and exit two times.'				

(2) Is ABAB compatible with 'many times'?

If yes, verbs of the ABAB pattern do not exhibit decreasing function since they are compatible with large numbers of repetitions; if no, verbs of the AABB pattern express decreasing meaning. For example, is *zheng-li-zheng-li* compatible with 'many times'?

35. ni xu-yao zheng-li-zheng-li ni-de fang-jian hen-duo-ci.
You need organize-order-organize-order your room many times
'You need to clean your room many times.'

3.2.4 Summary

Test sentences were constructed based on several questions regarding syntactic properties of the assumed structures as well as semantic effects. The two patterns were tested on whether the reduplicative word is separable from the middle (e.g., [AA][BB]). Questions concerning this include if AA/BB of the AABB pattern is freestanding; if the insertion of *you* 'and' into the AABB/ABAB pattern is allowed; and if the perfective marker *le* is compatible with AABB/ABAB. The two patterns are also tested on 'deverbalization' by asking if a reduplicative word with a transitive base can take a direct object. Moreover, the two patterns were tested on their semantic effects. The increasing function of the AABB pattern was tested by asking if it is compatible with 'two times'; the decreasing function of the ABAB pattern was tested by asking if it is compatible with 'many times'.

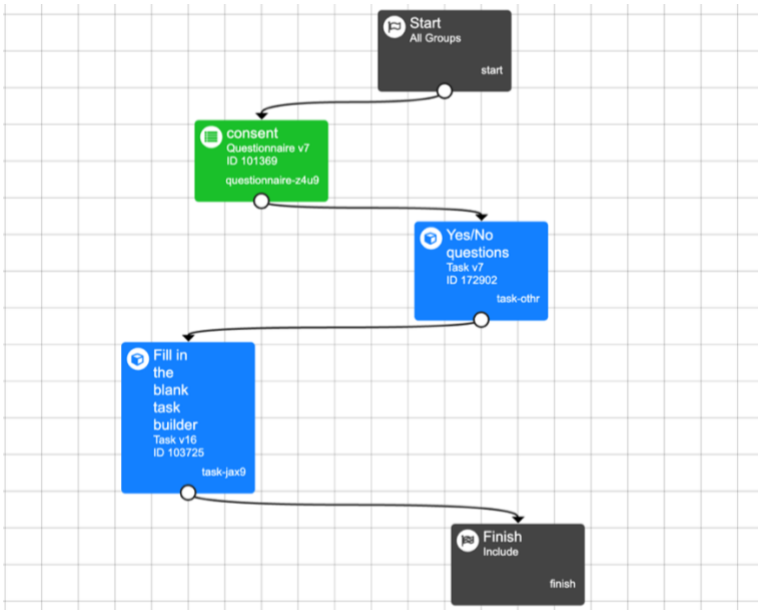
3.3 Participants

Eighty-five participants of native Mandarin speakers completed the experiment by the time the data was collected. Participants were recruited through PAWS of the University of Saskatchewan, the LinguistList organization, and in WeChat groups, from February to March of 2021. All participants who consented were above the age of 18. All participants currently live in China and/or use Mandarin on a daily basis. Participants who are native speakers but are not able to read and comprehend Mandarin did not meet my requirements. Therefore, the degree of participants' language familiarity with verb reduplication is considered high.

3.4 Instruments

The experiment was designed in Mandarin Chinese by using the software *Gorilla* (see https://gorilla.sc/). The flow chart below (Figure 3.2) demonstrates the overall structure of the experiment. All constructed sentences in the two tasks were randomized.

Figure 3.2 The structure of the experiment

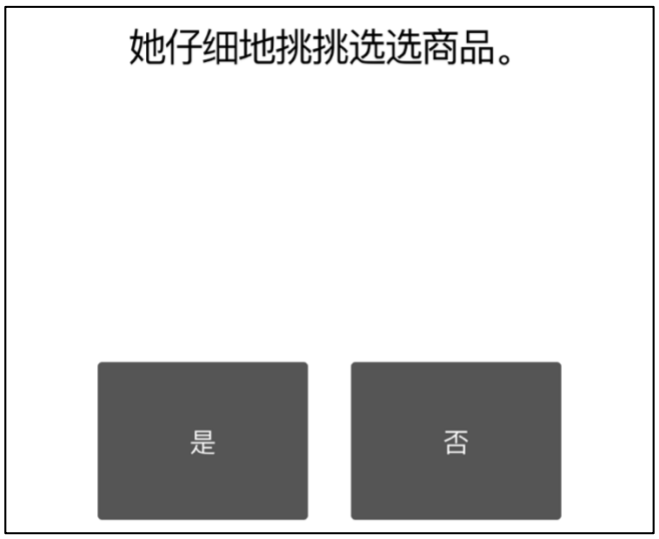


3.5 Procedure

This online experiment has been approved by the University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) assigned with the Ethics ID BEH-2113. The survey was posted with recruitment policies on Paws of the University of Saskatchewan, the Linguist List organization, and in WeChat groups. Participants would click on a simple link that would log them in automatically.

The whole experiment took about ten minutes to complete. Participants would first read the consent form, and only if they check the agree box can they start the experiment. Then they would conduct two tasks and click ‘finish’ to submit (Figure 3.2). The first part of the experiment is a grammaticality judgment task. There were 96 sentences in total. Participants were asked to read the sentence appearing at the center of the screen and then click the ‘yes’ or ‘no’ button at the bottom (see Figure 3.3 below). If participants were not sure about the acceptability of a sentence, they were asked to click ‘no’.

Figure 3.3 Part 1: Acceptability task

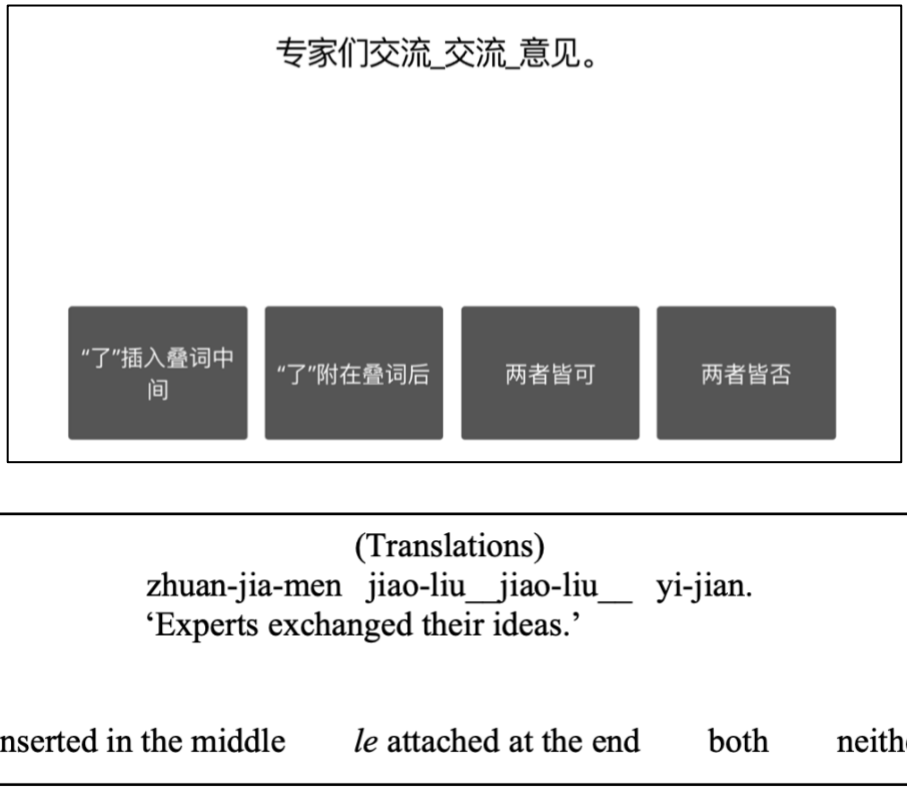


(Translations)
ta zi-xi-de tiao-tiao-xuan-xuan shang-pin.
'She picked and chose products carefully.'

Yes No

The second part of the experiment was a fill-in-the-blank task, which tested whether and how the perfective marker *le* matches with a reduplicative pattern. Participants went through the instructions and were guided with a practice test which illustrated how they should complete the task. Then, participants were asked to read the sentence appearing on the screen and consider in which blank they would put the perfective marker *le* (see Figure 3.4 below). Four options were given at the bottom, i.e., 1) insert *le* into the middle of a reduplicative word (i.e., AB-*le*-AB, AA-*le*-BB); 2) attach *le* at the end of a reduplicative word (i.e., AB-AB-*le*, AA-BB-*le*); 3) the first two options are both acceptable; 4) the first two options are both unacceptable. This part consists of 24 blanked sentences.

Figure 3.4 Part 2: Fill-in-the-blank task



The final page would appear after participants completed all the tasks, and they would submit their survey by clicking the ‘finish’ button at the bottom. Participants who conducted part or the whole experiment but did not reach the finish node, i.e., failed to submit the survey, would be marked as ‘live’ (see Figure 3.5). A successful submit would be marked as ‘complete’. Therefore, live participants were excluded from the data. Complete participants’ data were generated and saved as CSV files.

Figure 3.5 Participants’ status

PublicID	Name	Email Address	Recruitment Policy	Group	Version	Checkpoint	Progress	Status	Included
ffosxn7u			Simple Link		13		View Progress	Complete	✔
9pobrync			Simple Link		13		View Progress	Complete	✔
y2frrsds			Simple Link		13		View Progress	Live	

CHAPTER 4 STUDY RESULTS

To better compare the two patterns, the test questions discussed in Chapter 3 are listed in pairs below. Note that Q1 is tested only for the AABB pattern because AB as the original base verb of the ABAB pattern is naturally freestanding.

Q1: Can AA or BB from the AABB pattern stand alone as a verb (i.e., AA-BB)?

Q2: Is the insertion of *you* 'and' between AA and BB (i.e., AA-*you*-BB) acceptable?
Q3: Is the insertion of *you* 'and' between ABAB (i..e, AB-*you*-AB) acceptable?

Q4: Can AABB (with a transitive base verb) take any object?
Q5: Can ABAB (with a transitive base verb) take any object?

Q6: Is AABB compatible with 'two times'?
Q7: Is ABAB compatible with 'many times'?

Q8: Is the perfective marker *le* (inserted in the middle/attached to the end) compatible with the AABB pattern?
Q9: Is the perfective marker *le* (inserted in the middle/attached to the end) compatible with the ABAB pattern?

This chapter has five sections in total with each comparing the two patterns. Four invalid responses were removed from the data after which 81 responses were imported to Excel for text cleaning and sorting procedures. Statistical analysis was performed in R version 3.6.2 (R Core Team, 2019). Descriptive statistics are illustrated by bar charts in each section. Section 4.1 reports on the results of participants' judgments on the freestanding ability of the base of AABB (i.e., Q1). The other four sections compare the two patterns from different aspects. Section 4.2 reports on the results of Q2&Q3. Section 4.3 reports on the results of Q4&Q5. Section 4.4 reports on the results of Q6&Q7. Section 4.5 reports on the results of Q8&Q9. In Section 4.2 and 4.3, generalized linear mixed regression models were created by using the *glmer* function (Bates et al., 2015) to compare the two patterns with respect to separability and deverbalization. In each of the models, the dependent variable/output is participant responses, i.e., YES/NO. The

responses were coded as numerals[10], with 0 representing 'YES' and 1 representing 'NO'. Therefore, the model treats 'NO' as the default outcome. The independent variable/output is the two patterns, i.e., AABB or ABAB. The model also includes *participants* as a random effect. The 95% confidence intervals were calculated using the *confint* function from the *lmerTest* package (Kuznetsova et al., 2014). In section 4.5, a multinomial logistical model was created by using the *multinom* function from *nnet* package (Venables & Ripley, 2013) to illustrate the distribution of the participant's responses in the *le*-insertion test. The dependent variable, i.e., participants' response, is a categorical variable without order ('both', 'end', 'middle', and 'neither'). The independent variable is the two patterns. The model includes *participants* as a random effect. P-values were computed using Wald tests.

In Sections 4.2, 4.3, 4.4, and 4.5, the two patterns were also compared with respect to reaction time by performing the linear regression analysis using the *lmer* function (Bates et al., 2015). The independent variable is participants' reaction time measured in milliseconds. The predictors include participants' responses, the two patterns, as well as *participant*s as a random effect.

4.1 Test on AA/BB Standing Alone

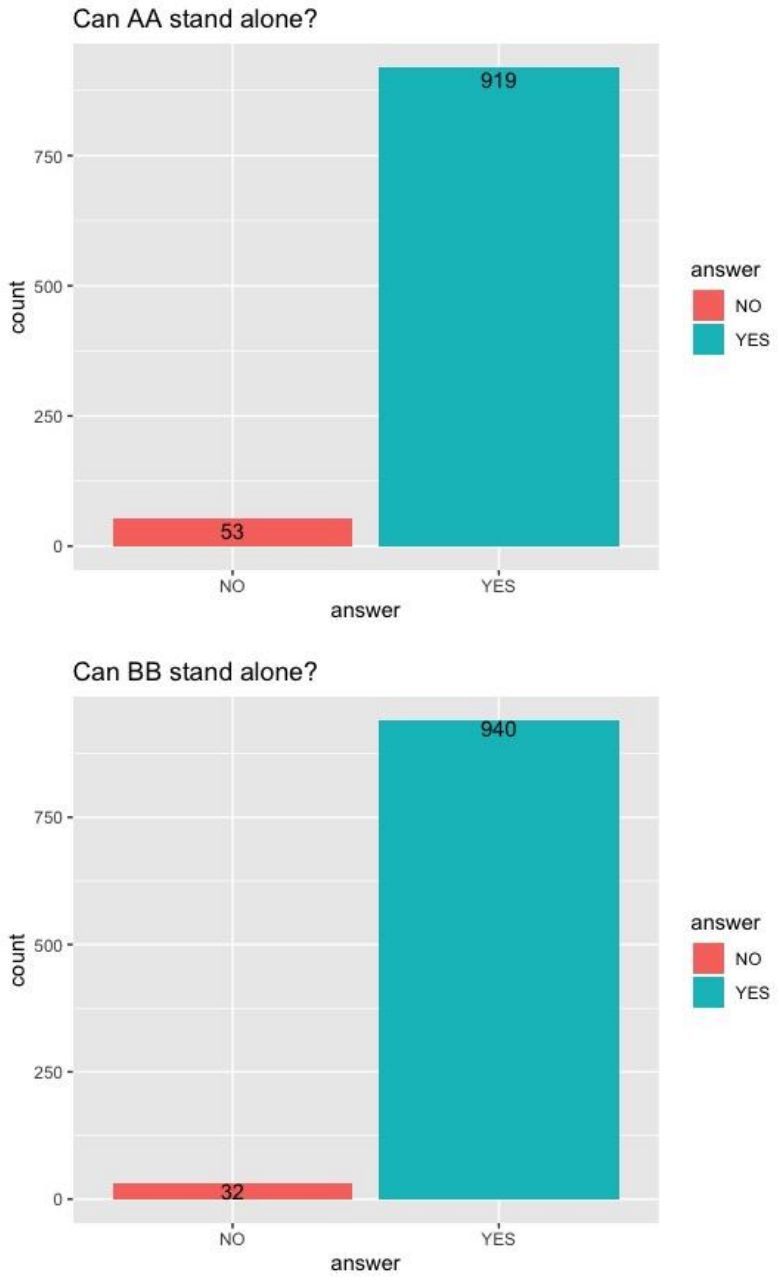
Q1 is to test whether the AABB pattern is separable from the middle. According to the hypothesis, the structure of the AABB pattern is a combination of two constituents AA and BB. AA or BB is supposed to be freestanding in a sentence. Sentences (36a) & (36b) were constructed with the verb *tu-tu-gai-gai* 'paint-paint-change-change'. Sentence (36a) contains *tu-tu* 'paint-paint', i.e., AA; while (35b) contains the other half of the verb *gai-gai* 'change-change', i.e., BB. Participants should judge if the sentences are grammatical. The results of the question are shown in Figures 4.1 and 4.2 below.

35a.	nv-hai-zi-men	xi-huan	tu-tu	zhi-jia-you.
	girl-plural	like	paint-paint	nail polish.
	'Girls like painting nails.'			

[10] The test on Q8&Q9 in section 4.5 has four responses which cannot be simply coded as yes or no. To keep consistency, all responses in the tests were coded using numbers.

35b. ni ying-gai gai-gai ni-de jina-li le.
you should change-change your resume SFP
'You should upgrade your resume.'

Figure 4.1 The acceptability of AA/BB standing alone in a sentence



The two graphs above illustrate the results of AA and BB respectively. When judging sentences that contain the first half of the AABB pattern, i.e., AA, most participants judge them as acceptable with 919 'YES' and 53 'NO' out of 972 responses. The rate of acceptability is about

95%. BB has similar results with 940 'YES' and only 32 'NO' out of 972 responses, suggesting the rate of acceptability is a little higher than AA, i.e., about 97%. This minor variation between AA and BB, though not large, is due to a specific verb. This will be discussed in detail in Chapter 5.

Figure 4.2 The acceptability of the separation of the AABB pattern

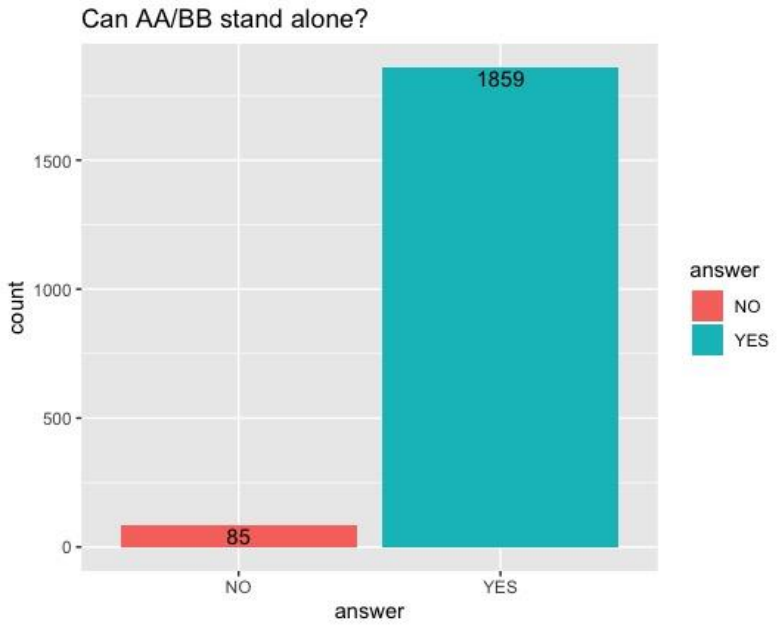


Figure 4.2 shows that overall, the majority of people judge it to be acceptable for AA or BB to stand alone in a sentence, which represents 95.63% of the data, i.e., 1859 out of 1944.

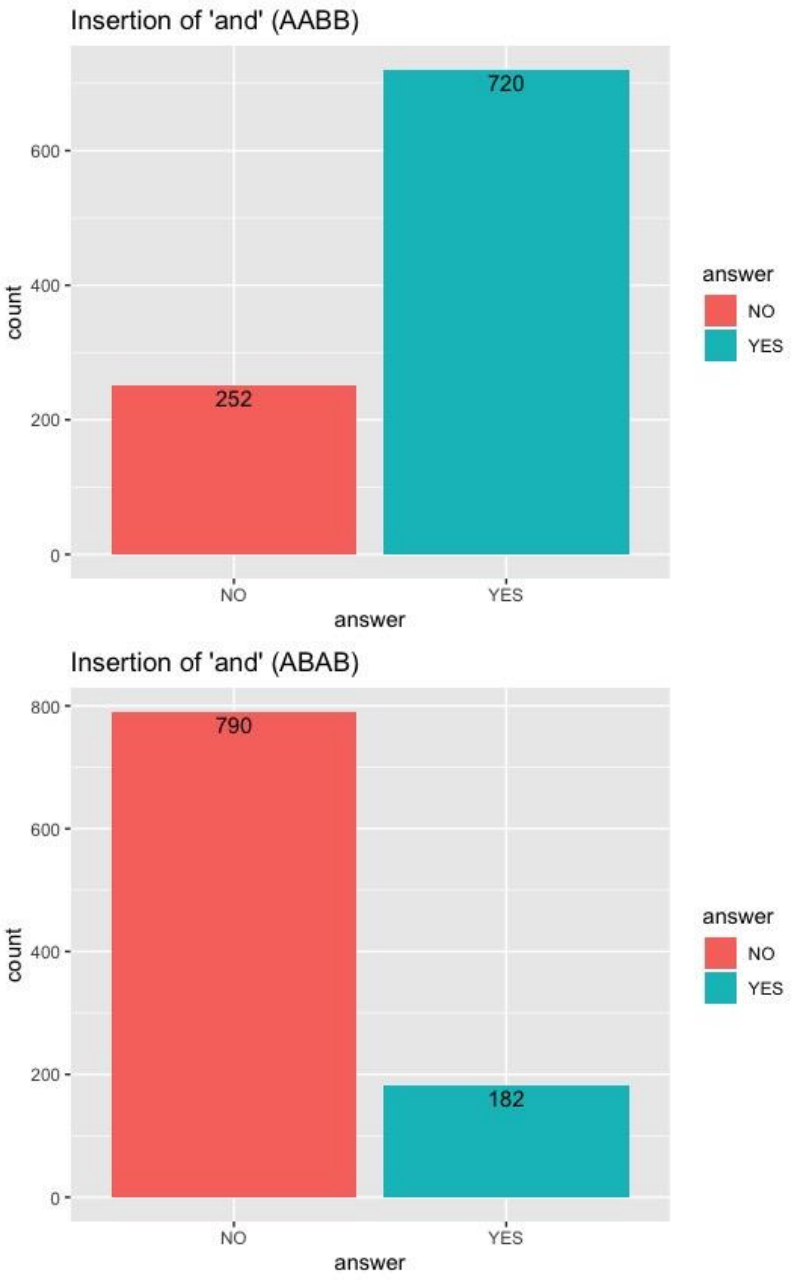
4.2 Test on Inserting *you* 'and'

Q2 and Q3 test whether *you* 'and' can be inserted into the middle of the patterns. In the sample sentence (37a), the constructed sentence contains *beng-beng-you-tiao*-tiao 'skip-skip-and-jump-jump', i.e., AA-*you*-BB; while sentence (37b) contains *duan-lian-you-duan-lian* 'forge-forge-and-smelt-smelt', i.e, AB-*you*-AB. Participants would read these sentences and make their judgments. The results of the two patterns are shown in Figure 4.3.

37a. hai-zi-men zai gong-yuan li beng-beng-you-tiao-tiao.
Children-plural at park inside skip-skip-and-jump-jump
'Children skip and jump at the park.'

37b. ni ying-gai duan-lian-you-duan-lian ni-de shen-ti.
you should forge-forge-and-smelt-smelt your body
'You should keep working out your body.'

Figure 4.3 The acceptability of the insertion of *you* 'and' between AABB/ABAB



The graph of AABB shows that the majority of people judge the insertion of *you* 'and' into the AABB pattern to be acceptable, representing 74.1% of the data, i.e., 720 out of 972. In contrast, a small number of people disagree with this assessment, which accounts for 25.9% of the data, i.e., 252 out of 972. On the other hand, the distribution of ABAB demonstrates that people perceive the ABAB pattern differently from the AABB pattern with most people choosing 'NO' as their answer, which represents 81.3% of the data, i.e., 790 out of 972. Only a minority of participants found it acceptable to insert *you* 'and' into the ABAB pattern accounting for 18.7% of the data, i.e., 182 out of 972.

To better compare the two patterns, datasets of Q2 and Q3 were combined to perform a generalized linear mixed model analysis by using the *glmer* function (Bates et al., 2015). The results are summarized in Table 4.1 below.

Table 4.1 Results of the generalized linear mixed model (Q2 & Q3)

	Estimate	Std. Error	2.5%	97.5%	t-value	Pr(>|t|)
(Intercept)	-1.41	0.18	-1.78	-1.05	-7.62	2.48e-14 ***
Pattern: ABAB	3.37	0.15	3.08	3.68	22.22	<2e-16 ***

The intercept with a value of -1.41 means that the probability of participants perceiving the insertion of *you* 'and' into the AABB pattern as unacceptable is 19.62% [β=-1.41, SE=0.18, t=-7.62, $p<0.01$, CI95=-1.78:-1.05]. The log-odds value of the ABAB pattern is 1.96 (-1.41 (intercept)+3.37 (Pattern: ABAB)), suggesting the probability of participants choosing 'NO' for the insertion of *you* 'and' into the ABAB pattern is 87.65% [β=3.37, SE=0.15, t=22.22, $p<0.01$, CI95=3.08:3.68]. The model suggests that the ABAB pattern is different from the AABB pattern, with the former having much lower acceptability than the latter.

Additionally, the two patterns were compared with respect to reaction time. A linear regression analysis using the *lmer* function (Bates et al., 2015) was performed in R. The results are reported in Table 4.2 below.

Table 4.2 Summary of the linear regression model on reaction time (Q2&Q3)

	Estimate	Std. Error	2.5%	97.5%	t-value
(Intercept)	3333.0	205.0	2930.36	3734.72	16.258
Answer: No	571.7	256.6	67.20	1074.32	2.228
Pattern: ABAB	-908.2	241.8	-1381.49	-433.44	-3.757

The intercept indicates that when judging sentences that contain the AABB pattern, participants took an average of 3333 ms (3.3 seconds) to respond YES, while they took 3904.7 ms (3333.0 (intercept) + 571.7 (Answer: No)) to respond NO. For the ABAB pattern, participants spent, on average, 2424.8 ms (3333 (intercept) -908.2 (Pattern: ABAB) on responding 'YES' while it took them 2996.5 ms (3333.0 (intercept) + 571.7 (Answer: No)) - 908.2 (Pattern: ABAB) to respond 'NO'. This suggests that, for both the patterns, it took more time for participants to judge a sentence as ungrammatical. The model also reveals that participants would respond almost one second faster ('NO': 3333 - 242.8 = 908.2 ms; 'YES': 3904.7 - 2996.5 = 907.9 ms) to the test sentences constructed for the ABAB pattern than the AABB pattern.

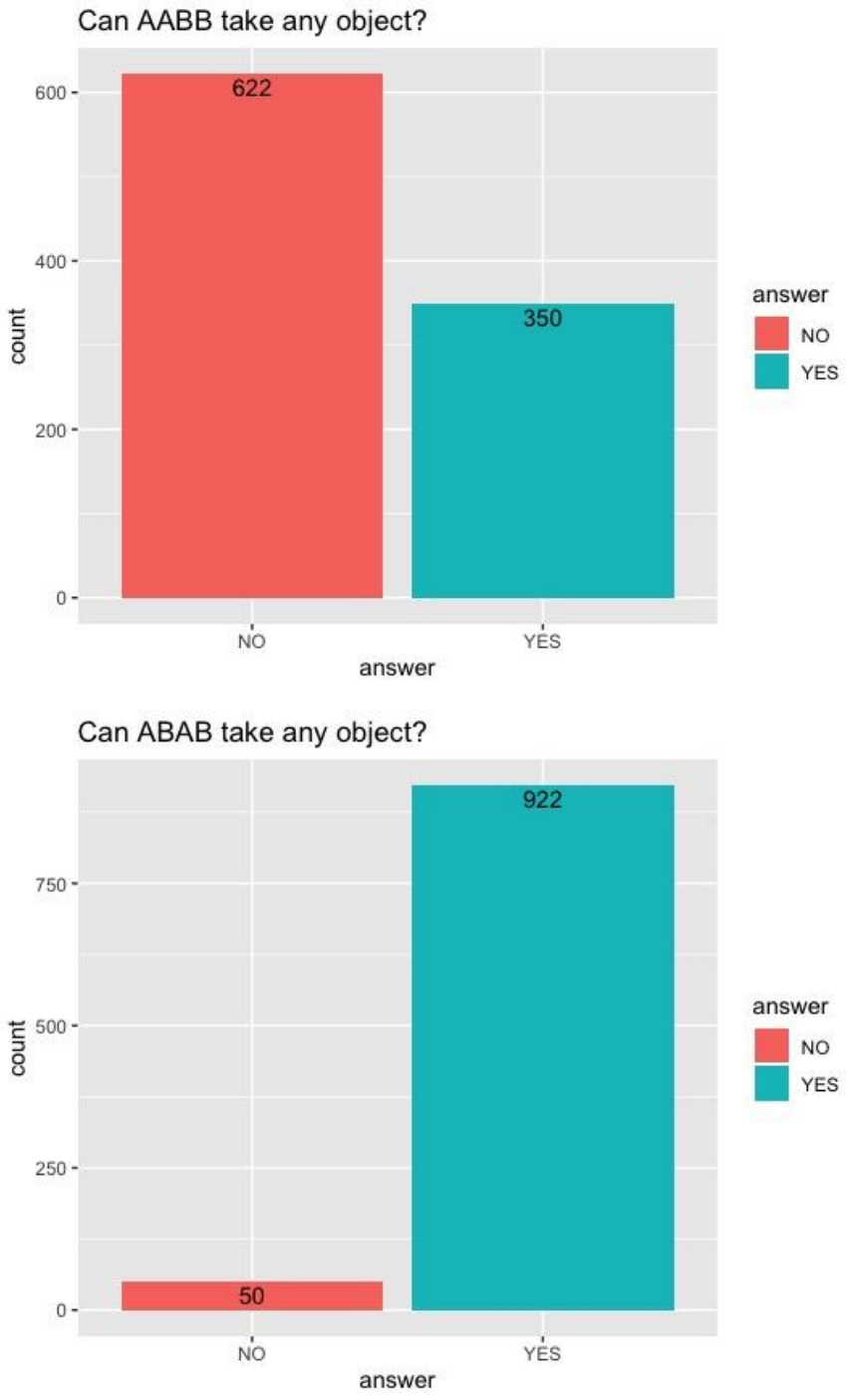
4.3 Test on AABB/ABAB Taking an Object

Q4 and Q5 are to test whether the verb from each pattern remains transitive after reduplication. All the selected verbs have a transitive base. In sentence (38), *can-ju* 'tableware' is originally a direct object of the base verb *xi-shua* 'wash-brush'. Participants should judge if the sentence remains grammatical when the base gets reduplicated as the AABB pattern *xi-xi-shua-shua* 'wash-wash-brush-brush'. In the same way, participants should judge if the sentence (38b) is still acceptable after the transitive base is reduplicated as the ABAB pattern. The results of the two patterns are shown in Figure 4.4.

38a. wo zai xi-xi-shua-shua can-ju.
I PROG wash-wash-brush-brush tableware
'I am washing dishes.'

38b. wo da-sao-da-sao zhe-ge fang-jian.
I prefix-clean-prefix-clean this-CL room
'I clean the room a bit.'

Figure 4.4 The acceptability of AABB/ABAB with an object



The graph of AABB shows that more people thought the AABB pattern would become intransitive after reduplication with 622 ‘No’ out of 972 answers, representing 64% of the data;

while fewer participants choose ‘YES’ as their answer, suggesting they think that the reduplicated verb still can take an object, accounting for 36% of the data, i.e., 350 out of 972. The distribution of ABAB demonstrates that significantly more people chose ‘YES’ instead of ‘NO’. This means for the ABAB pattern, most people think it remains transitive, which accounts for 94.9% of the data, i.e., 922 out of 972; while only a few participants think it loses transitivity after reduplication representing 5.1% of the data, i.e., 50 out of 972. This result is likely due to the deverbalization of the AABB pattern, which shows adjective-likeness features as compared to the ABAB pattern. This will be discussed in Chapter 5.

Table 4.3 Results of the generalized linear mixed model (Q4& Q5)

	Estimate	Std. Error	2.5%	97.5%	t-value	Pr(>|t|)
(Intercept)	0.70	0.15	0.41	1.00	4.76	1.93e-06 ***
Pattern: ABAB	-4.12	0.19	-4.5	-3.75	-21.45	<2e-16 ***

The Q4 and Q5 datasets were combined in a generalized linear mixed model. The results are summarized in Table 4.3. The intercept with a value of 0.70, means that the probability of participants choosing ‘NO’ for the sentences containing the AABB pattern is 66.82% [β=0.70, SE=0.15, t=4.76, $p<0.01$, CI95=0.41:1.00]. Meanwhile, the log-odds value of the ABAB pattern, decrease by 4.12, to -3.42 (0.70 (intercept) - 4.12 (Pattern: ABAB)), which indicates that the probability of participants responding to ‘NO’ for the ABAB pattern is 3.17% [β=-4.12, SE=0.19, t=-21.45, $p<0.01$, CI95=-4.5:-3.75]. The model suggests that the ABAB pattern is significantly different from the AABB pattern as most participants feel that the ABAB pattern remains a transitive verb while the AABB would lose its transitivity.

Table 4.4 Summary of the linear regression model on reaction time (Q4&Q5)

	Estimate	Std. Error	2.5%	97.5%	t-value
(Intercept)	2652.7	289.9	2083.63	3220.39	9.149
Answer: No	1255.4	292.1	680.88	1827.50	4.298
Pattern: ABAB	-401.7	268.0	-928.16	123.09	-1.499

The results of a linear regression analysis (Table 4.4) reveal that the AABB pattern differs from the ABAB pattern with respect to reaction time. The intercept indicates that participants took an average of 2652.7 ms to choose 'YES' for the AABB pattern, this reaction time decreases by 401.7 ms to choose 'YES' in the ABAB task. For the answer 'NO', participants took, on average, 3908.1 ms (2652.7 (intercept) + 1255.4 (Answer: No) to judge the sentences containing the AABB pattern, while they took less time to judge the sentences from the ABAB pattern, i.e., 3506.4 ms (2652.7 (intercept) + 1255.4 (Answer: No) – 401.7 (Pattern: ABAB)). This model suggests that, regardless of patterns, participants needed more time to respond to potentially ungrammatical sentences and responses were faster in the ABAB tasks.

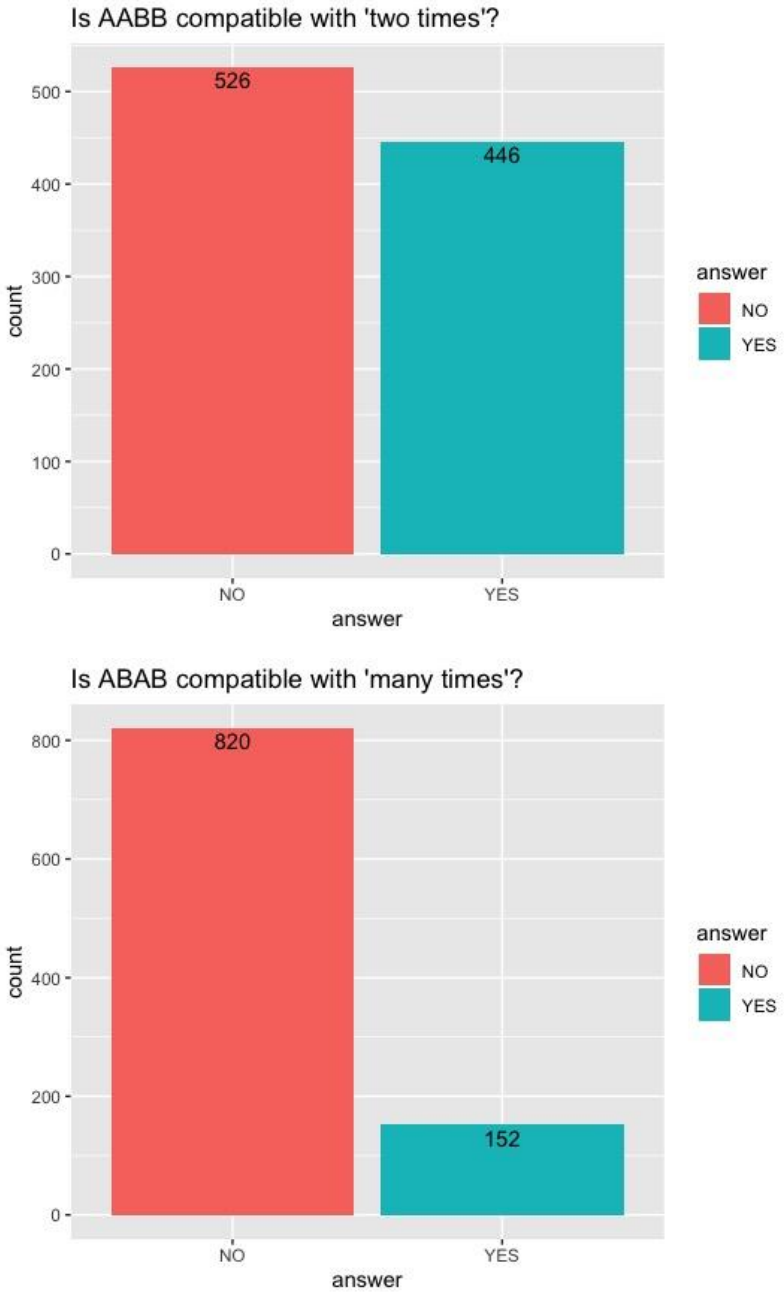
4.4 Test on Decreasing/Increasing Function

The Q6 and Q7 datasets were used to test the semantic differences between the two patterns. Each pattern corresponds to iteration. Without the reduplication, the event meanings would be without repetition. While AABB increases the frequency of the iteration, ABAB limits this frequency to a small number. In other words, the AABB pattern exhibits increasing function meaning 'to do something multiple times'. Therefore, the AABB words are supposed to be incompatible with adverbs of low frequency (e.g., *liang-ci* 'two times' in example 39a). The ABAB pattern, on the contrary, exhibits the decreasing function meaning 'to do something a little bit'. Hence, it supposedly does not match with adverbs of large numbers or frequency such as *hen-duo-ci* 'many times' as in (39b).

39a. wo-men shuo-shuo-xiao-xiao liang-ci.
I-plural talk-talk-laugh-laugh two times
'We talked and laughed two times.'

39b. wo da-sao-da-sao zhe-ge fang-jian hen-duo-ci
I prefix-clean-prefix-clean this-CL room many times
'I clean the room many times.'

Figure 4.5 The acceptability of adverbial modification



The results of the two patterns are shown in Figure 4.5 above. The distribution of AABB demonstrates that the variation between the number of participants choosing ‘YES’ and ‘NO’, while significant, is not large. However, more people still felt that the AABB pattern does not match ‘two times’ representing 54.12% of the data, i.e., 526 out of 972; while fewer participants judge the AABB pattern to be compatible with ‘two times’, which accounts for 45.88% of the

data, i.e., 446 out of 972. The variation is not large, which indicates that the AABB pattern with increasing function may match small frequency such as ‘two times’ in some contexts. It will be elaborated in the discussion that the event described by the base of the pattern may happen a small number of times on different occasions. On the other hand, the graph of ABAB demonstrates that there is a significant a clear variation between the two answers. Most participants judge the ABAB pattern as incompatible with ‘many times’, with the ‘NO’ responses representing 84.36% of the data, i.e., 820 out of 972. Only a small number of people think the pattern is compatible with ‘many times’ accounting for 15.64% of the data, i.e., 152 out of 972.

Q6 tests the AABB pattern’s compatibility with adverbs of small frequency, e.g., ‘two times’, while Q7 focuses on if the ABAB pattern matches adverbs of large frequency, e.g., ‘many times’. I was not able to build a generalized linear mixed model since the research questions are not the same. Therefore, the two patterns were only compared on participants’ reaction time, as shown in Table 4.5 below.

Table 4.5 Summary of the linear regression model on reaction time (Q6&Q7)

	Estimate	Std. Error	2.5%	97.5%	t-value
(Intercept)	3734.5	673.2	2414.40	5052.53	5.547
Answer: No	760.0	751.4	-715.00	2231.36	1.011
Pattern: ABAB	-962.6	649.6	-2234.78	311.59	-1.482

For the AABB task, participants took an average of 3734.5 ms to respond ‘YES’ while they took 4484.5 ms (3734.5 (intercept) + 760.0 (Answer: No)) to respond ‘NO’. For the ABAB pattern, it took participants on average, 2771.9 ms ((3734.5 (intercept) - 962.6 (Pattern: ABAB) to respond ‘YES’ while it took them 3531.9 ms (3734.5 (intercept) + 760.0 (Answer: No2) - 962.6 (Pattern: ABAB) to respond ‘NO’. This indicates that participants spent more time on both the AABB task and to evaluate ungrammatical sentences.

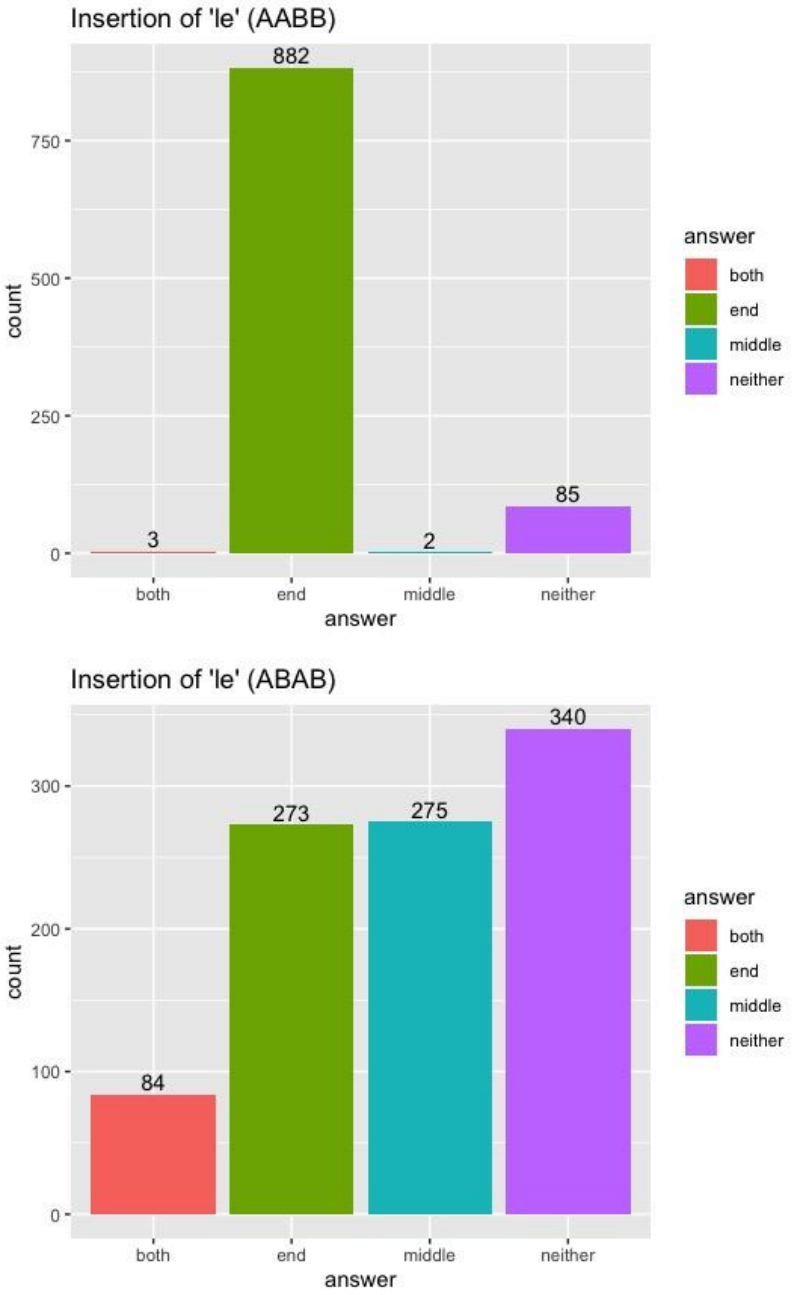
4.5 Test on Insertion of *le*

Q8 and Q9 are to test the syntactic differences between the two patterns with respect to the insertion of the perfective marker *le*. In the sample sentence (40a), two blanks are added in the field of the AABB word *feng-feng-bu-bu*. The first blank in the middle of the word corresponds to the insertion of *le*, while the second blank means the attachment of *le* at the end of the word. Four options were given to the participants: (1) insert *le* into the middle of a reduplicative word (i.e., AB-*le*-AB, AA-*le*-BB); (2) attach *le* at the end of a reduplicative word (i.e., AB-AB-*le*, AA-BB-*le*); (3) the two positions are both acceptable; and (4) neither of the two positions is acceptable. Sentence (40b) is a sample sentence constructed for the AABB pattern. Participants would read the sentence and consider in which blank they can insert the perfective marker *le*. The results of the two patterns are shown in Figure 4.6.

40a.	ta	feng-feng_bu-bu_	yi	bei-zi.
	she	sew-sew-mend-mend	one	life-suffix
	'She sewed and mended the whole lifetime.'			

40b.	wo-men	tao-lun_tao-lun_	zhe-ge	wen-ti.
	I-plural	discuss-discuss-discuss-discuss	this-CL	problem
	'We discussed this problem a bit.'			

Figure 4.6 Response to the AABB/ABAB pattern concerning the perfective marker *le*



The distribution of AABB demonstrates that out of four options, the vast majority of participants prefer to attach the perfective marker *le* to the end of the AABB pattern, which accounts for 90.74% of the data (882 out of 972 responses). Fewer participants believe that *le* should be inserted in the middle, representing 8.74% of the data (85 out of 972 responses). Almost no participants believe that both positions are acceptable (3 out of 972 responses). The same is true

for the option of ‘neither of the two positions is acceptable’ with the number of responses being only 2.

On the other hand, the graph of ABAB shows that the number of responses for the option of ‘neither of the two positions is acceptable’ is the largest among all the options, which is 340 out of 972. The number of responses for the option of ‘attached to the end’ is 273, which is very close to that of ‘inserted in the middle’, i.e., 275. In contrast, only a small number of participants accept both positions, accounting for 8.64% of the data, i.e., 84 out of 972.

The datasets of Q8 and Q9 were combined to perform a multinomial logistic regression analysis. Table 4.6 includes the summaries of coefficients, standard errors, t-values and p-values.

Table 4.6 Results of the generalized linear mixed model (Q4& Q5)

Coefficients			Std. Errors		
	Intercept	Pattern: ABAB		(Intercept)	Pattern: ABAB
end	5.684	-4.505	end	0.578	0.592
middle	-0.405	1.591	middle	0.913	0.921
neither	3.344	-1.946	neither	0.587	0.600

t-values			p-values		
	Intercept	Pattern: ABAB		Intercept	Pattern: ABAB
end	9.828	-7.614	end	0.000e+00	2.642e-14
middle	-0.444	1.727	middle	6.569e-01	8.412e-02
neither	5.692	-3.243	neither	1.252e-08	1.181e-03

Confidence intervals						
	end		middle		neither	
	2.5 %	97.5 %	2.5%	97.5%	2.5%	97.5%
(Intercept)	4.550	6.817	-2.195	1.383	2.193	4.495
Pattern: ABAB	-5.664	-3.345	-0.214	3.397	-3.122	-0.770

The intercept, which is the baseline, corresponds to the response of ‘both’ for the AABB pattern. The coefficients, represented by log-odds values, indicate the change in the mean response associated with a change in one predictor while the other predictors in the model are held constant. If looking at the results vertically, the coefficients in the intercept column suggest that for the AABB pattern, the log-odds value of choosing ‘end’ vs. ‘both’ will increase by 5.684

[β=5.684, SE=0.578, t=9.828, p=0.000, CI95=4.550:6.817]; the log-odds value of choosing 'middle' vs. 'both' for the AABB pattern will decrease by 0.405, though not significant [β=-0.405, SE=0.913, t=-0.444, p=0.657, CI95=-2.195:1.383]; the log-odds value of choosing 'neither' vs. 'both' will increase by 3.344 [β=3.344, SE=0.587, t=5.692, p<0.01, CI95=2.193:4.495]. Therefore, compared to the option 'both', the chance of choosing 'end' and 'neither' for participants will be higher, with 'end' having the highest probability (5.684 (end) > 3.344 (neither)). The chance of choosing 'middle' is lower than 'both', i.e., the lowest probability among all options. Hence, the probability ranking of four options (i.e., end > neither>both > middle) confirms the descriptive results shown in Figure 4.6.

In contrast, the ABAB pattern shows different results compared to the AABB pattern. The log-odds value of choosing 'end' vs. 'both' is 1.179 (5.684 (intercept) - 4.505 (Pattern: ABAB)); the log-odds value of choosing 'middle' vs. 'both' is 1.186 (-0.405 (intercept) + 1.591 (Pattern: ABAB)), though not significant (p=0.08); and the log-odds value of choosing 'neither' vs. 'both' is 1.398 (3.344 (intercept) - 1.946 (Pattern: ABAB)). Therefore, compared to the option 'both', the chance of choosing 'end', 'middle' and 'neither' for participants will be higher since the log-odds values are all positive. More specifically, the chance of choosing 'neither' is the highest among the four options, followed by 'middle' and then 'end' (1.398 > 1.186 > 1.179), whereases the chance of choosing 'both' is the lowest. Therefore, the probability ranking of the four options (i.e., neither > middle > end > both) conforms to the descriptive results shown in Figure 4.6.

Table 4.7 Summary of the linear regression model on reaction time (Q8&Q9)

	Estimate	Std. Error	t-value	2.5%	97.5%
(Intercept)	6100.342	1723.517	3.539	2712.440	9476.831
Response: End	-1398.103	1625.737	-0.860	-4582.555	1805.586
Response: Both	8.731	2449.077	0.004	-4792.076	4851.695
Response: Neither	-1669.759	1589.313	-1.051	-4778.039	1443.586
Pattern: ABAB	1287.270	1166.228	1.104	-993.557	3579.135

Table 4.7 illustrates the results of a linear regression model on reaction time. The participants took an average of 6100 ms to respond 'middle', in the AABB task [β=6100, SE=1723.517, t=3.539, CI95=2712 : 9476]. The reaction time of the response 'end' averaged 4702 ms (6100 (intercept) -1398 (Response: End). The reaction time for 'both' averaged 6109 ms (6100

(intercept) + 8.7 (Response: Both)). The reaction time for ‘neither’ averaged 4430 ms (6100 (intercept) - 1669 (Response: Neither)). In the ABAB task, participants took on average 7387 ms (6100 (intercept) + 1287 (Pattern: ABAB) to choose ‘middle’, 5989 ms (6100.342 (intercept)-1398.103 (Response: End) + 1287.270 (Pattern: ABAB)) to choose ‘end’, 7396.343ms (6100.342 (intercept) + 8.731 (Response: Both) + 1287.270 (Pattern: ABAB)) to choose ‘both’, and 5717.853ms (6100.342 (intercept) - 1669.759 (Response: Neither) + 1287.270 (Pattern: ABAB)) to choose ‘neither’.

The results of the model, though most of the results are not significant, suggest that the reaction time of ‘end’ and ‘neither’ is shorter than ‘middle’ and ‘both’ in general. In other words, participants needed more time to think if the insertion of the perfective marker is acceptable, while they took less time to respond when there is no insertion (i.e., attaching *le* to the end, neither insertion nor attachment). Moreover, participants took more time to respond in the ABAB task.

CHAPTER 5 DISCUSSION

5.1 Separability of the AABB Pattern

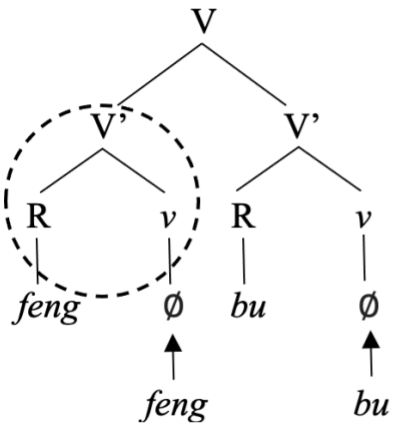
The results of Q1 show that most participants perceive AA and BB as freestanding verbs in a sentence, which supports the hypothesis that AA can be separated from BB. For example, sentence (41a) contains the first half of the word *zhi-zhi-dian-dian,* i.e., *zhi-zhi,* and sentence (41b) was made from the other half *dian-dian*. In both sentences, AA/BB each was used as a verb. The response rate for 'YES' was significantly high, according to Figure 4.2 (Section 4.1 Chapter 4).

41a.	ta	**zhi-zhi**	ban-gong-zhuo	shang-de	yi-luo	wen-jian.
	she	point-point	desk	upside-DE	a-CL	paper
	'She pointed to a pile of papers on the desk.'					

41b.	ta	zhi-hao	**dian-dian**	tou.
	he	only	nod-nod	head
	'He could only nod.'			

Note that the proposed structure of the AABB reduplicative process indicates that the AABB pattern is a result of each component morpheme projecting its own category. In other words, the AABB reduplication is seen as the combination of the AA reduplication and BB reduplication, which is, in fact, a domain of monomorphemic verb reduplication. The circled part in the structure of the AABB pattern (Figure 5.1) illustrates the reduplicative process for the AA pattern. The structure predicts that each reduplication AA and BB form a verb on its own due to the merging with the categorizer. The root *feng* 'sew' merges with a categorizer which is originally a null morpheme. The replacement of this null morpheme by the reduplicant morpheme *feng* will form the word *feng-feng*, i.e., a reduplication of the monomorphemic verb *feng*.

Figure 5.1 The AABB reduplication of *feng-feng-bu-bu*



feng-feng-bu-bu
sew-sew-mend-mend
'to sew and mend multiple times'

According to Deng (2013), monomorphemic verb reduplication has aspectual constraints on the base, just like the two patterns AABB/ABAB discussed here. Achievement verbs cannot be reduplicated as the AA pattern. For instance, the reduplications of two achievement verbs *jin* 'enter' and *chu* 'exit' are not grammatical (41). Therefore, verbs like *jin-jin-chu-chu* were not selected to construct sentences in this test because participants would judge them as ungrammatical sentences due to the invalid reduplication of achievement verbs.

42a.	*ta	xiang	**jin-jin**	fang-jian	li.
	he	want	enter-enter	room	inside
	'He wants to enter the room. '				

42b.	*ta-men	ji-jiang	**chu-chu**	cheng.
	he-plural	will	exit-exit	town
	'They will leave the down.'			

With achievement verbs excluded from the test, there were a few 'NO' responses with 53 from the results of the AA pattern and 32 from the BB pattern. This minor variation between the distribution of AA and BB is most likely due to a specific verb *tu-tu-gai-gai* 'to erase and alter multiple times'. Sentence (43a) contains the first half of the word *tu-tu* 'erase; paint' while sentence (43b) contains the other half *gai-gai* 'alter; change'. 18 out of 81 participants judged sentence (43a) as ungrammatical, while only 2 participants judged sentence (43b) as unacceptable.

43a.	nv-hai-zi-men	xi-huan	**tu-tu**	zhi-jia-you.	
	girl-plural	like	paint-paint	nail polish.	
	‘Girls like painting nails.’				
43b.	ni	ying-gai	**gai-gai**	ni-de	jina-li	le.
	you	should	change-change	your	resume	SFP
	‘You should upgrade your resume.’					
43c.	*ta	xi-huan	ou-er	da	lan-qiu.	
	He	like	occasionally	play	basketball	
	‘He likes playing basketball occasionally.’					

However, the difference between the acceptability of AA and BB does not contradict the hypothesis since there are semantic constraints of the verb *xi-huan* ‘like’ in the sentence (42a). The verbal phrase *xi-huan* ‘like doing something,’ indicates that a person tends to do the thing frequently on a regular basis. On the other hand, according to Arcodia et al. (2014), the semantic interpretation for the AA reduplication is the same as the ABAB pattern, which exhibits decreasing function, roughly translated as ‘to do something a little bit or a small number of times’. Therefore, the semantics of the AA pattern is not compatible with adverbs of large frequency or longer duration.

Furthermore, the verb *xi-huan* in (42a) semantically selects non-temporal entities but excludes any episodic eventualities (Deng, 2019). For example, *xi-huan* is not compatible with *ou-er* ‘occasionally’ (42c). Hence, the inherent meaning of *xi-huan*, i.e., ‘like doing something frequently’ in a constant and/or periodic state, contradicts the decreasing function that the AA reduplication *tu-tu* possesses, which makes the sentence ungrammatical. By contrast, the modal verb *ying-gai* ‘should’ in (43b) does not impose any contradictory semantic interpretation on the reduplicated meaning. Therefore, it was perceived as a grammatical sentence by participants.

For the ABAB pattern, it is unnecessary to test whether the pattern is separable from the middle because the ABAB reduplication is a result of copying the whole base, i.e., AB-AB. A disyllabic verb AB is naturally freestanding (44). However, the base of the ABAB pattern contains at least one bound root, meaning there is always one morpheme that cannot stand alone in a sentence. For example (43a), the morpheme *jiao* ‘exchange’ and *liu* ‘communicate’ are both bound roots. A bound root can only attach to another root (free or bound) to convey meaning properly. Therefore, for the base of the ABAB pattern, root A is not separable from root B.

44a. wo-men jing-chang **jiao-liu** xiang-fa.
I-plural often exchange-communicate idea
'We often exchange our ideas.'

44b. zan-men hu-xiang **jiao-liu-jiao-liu** xiang-fa
I-plural each other exchange-communicate-exchange-communicate idea
'Let's exchange our ideas.'

On the other hand, the base of the AABB pattern is made up of two free roots, which enables the separation of the morpheme A from the morpheme B. For example, the morphemes *shuo* 'talk' and *xiao* 'laugh' from the base *shuo-xiao* 'be talking and laughing' can be used alone in a sentence (45). The two morphemes can be further reduplicated as AA and BB, respectively (46), hence the separation of the AABB pattern.

45a. ta zhi-shi zai **shuo** xiao-hua.
He just PROG talk joke
'He was just talking jokes.'

45b. ta da-sheng-de **xiao**.
She loud-de laugh
'She laughed loudly.'

46a. ta zhi-shi sui-bian **shuo-shuo**.
she only randomly talk-talk
'She didn't mean what she said.'

46b. ta mian-qiang **xiao-xiao**.
he constrainedly laugh-laugh.
'He laughed constrainedly.'

5.2 Insertion of *you* 'and'

With respect to whether *you* 'and' can be inserted into AABB/ABAB (e.g., 47), the results demonstrate that the insertion of *you* 'and' into the AABB pattern, i.e., the form AA-*and*-BB was accepted by most participants while the form AB-*and*-AB presented opposite outcomes. This conforms to the proposed structures, which predict that the AABB pattern is separable while the ABAB pattern is better viewed as a whole.

47a. na-dui qing-lv zong-shi **fen-fen-you-he-he**.
that-CL couple always separate-separate-and-reconcile-reconcile
'That couple breaks up and then gets back over and over.'

47b. *wo **xue-xi-you-xue-xi** bie-ren-de chang-chu.
I study-study-and--study-study other-DE forte
'I keep learning strength from others.'

Generally speaking, the majority of participants felt that sentences containing the form AA-*and*-BB are grammatical. However, the unacceptability rate for a few sentences testing the AABB pattern was notably higher than for others, around 25%. Some of that may be due to incompatible or less compatible collocations of the chosen subject and verb. For example, the sentence (48a) was constructed from the expression *lai-lai-hui-hui* 'come and go repeatedly'. The base *lai-hui* 'come and go' is a complex directional verb. In Mandarin, directions are expressed by locative words or directional verbs (Wu, 2010). Absolute/objective direction, unrelated to the speaker, is expressed by locative words such as 'east/west/south/north'. Relative/subjective direction, on the other hand, is tied to the speaker's position and perception (Ma, 1997). For instance, both *lai-lai-hui-hui* and *lai-lai-qu-qu* are translated as 'come and go repeatedly' with *lai* meaning 'come' and *qu/hui* meaning 'go'. The difference between *hui* and *qu* is that *hui* often indicates that the speaker/subject goes back to the place where the speaker/subject comes from (48b) while *qu* indicates the speaker feels or sees the action of someone/something going back (48c). Hence, in sentence (48a), *lai-lai-hui-hui* conveys the meaning that the subject of 'love' comes and goes repeatedly. However, *lai-hui* in Mandarin is often used in a sentence where the subject is a person/animal, or associated with the movement of machines, for example, 'these machines can cut beef back and forth' (48d). Therefore, the abstract noun 'love' being the subject may not match the expression *lai-lai-hui-hui* so well. The relatively higher unacceptability rate may thus be due to inappropriate collocation.

48a. ai-qing zong-shi **lai-lai-*you*-hui-hui**.
love always come-come-and-go-go
'Love always comes and goes.'

48b. wo-men zai zhe-tiao lu shang **lai-lai-hui-hui**
I-plural PREP this-CL road upside come-come-and-go-go
hao-duo-tang le.
many times SFP
'We've drifted up and down this road many times already.'

48c. wo ting-dao na-ge sheng-yin **lai-lai-qu-qu**.
I hear that-CL sound come-come-and-go-go
'I heard that sound coming and going.'

48d. zhe-xie ji-qi ke-yi **lai-hui** qie-ge niu-rou.
these machine can come-go cut beef
'These machines can cut beef back and forth.'
(https://www.wwyulu.com/read/10423.html)

Sentence (49a), constructed for the AABB pattern *chi-chi-he-he* 'eat and drink frequently', was also less accepted by participants. Similar to (48a), the inappropriate collocation could be the reason for the low acceptability. Sentence (49a) indicates that 'to wine and dine' is equivalent to travelling while (49b) indicates that 'to wine and dine' is the purpose of travelling. The latter sounds more semantically logical. Additionally, when the implied agent of the action 'to wine and dine' is overtly spelled out, e.g., me and my friends in (48c), the sentence sounds more natural.

49a. lv-xing jiu-shi **chi-chi-*you*-he-he**.
travelling is eat-eat-and-drink-drink
'Traveling is to wine and dine.'

49b. lv-xing-de mu-di jiu-shi **chi-chi-*you*-he-he**.
travel-DE purpose is eat-eat-and-drink-drink
'The purpose of travelling is to wine and dine.'

49c. mei-ci he peng-you chu-qu lv-xing jiu-shi
every-time with friend out travel is
chi-chi-*you*-he-he.
eat-eat-and-drink-drink
'Every time I travel with my friends, I wine and dine.'

On the other hand, the results for the ABAB pattern are clearer than for the AABB pattern. There are significantly more negative judgments than positive ones, indicating that most participants judged AB-*you*-AB as an ungrammatical form (50a, b, & c). Apart from structural inappropriateness, the high unacceptability rate is also attributed to semantic constraints of *you*

'and'. As mentioned in Chapter 3, *you* 'and' indicates the repetition and continuation of actions and behaviours. For example, with the insertion of *you*, the expression *duan-lian-you-duan-lian* in (50a) conveys an implied meaning of 'keep exercising on a regular basis'. However, the ABAB pattern exhibiting decreasing function indicates 'to exercise a bit or for a short time' (50d). Therefore, the semantic contradiction contributes to the low acceptability rate as well.

50a. *ni ying-gai **duan-lian-*you*-duan-lian** ni-de shen-ti.
you should forge-forge-and-smelt-smelt your body
'You should keep working out your body.'

50b. *wo **xue-xi-*you*-xue-xi** bie-ren-de chang-chu.
I study-study-and--study-study other-DE forte
'I keep learning strength from others.'

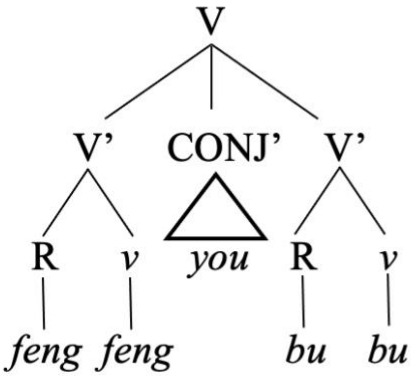
50c. *kuai jin wu li **nuan-huo-*you*-nuan-huo** shou.
quickly come house inside warm-suffix-and--warm-suffix hand
'Come in quickly and keep warming up your hands.'

50d. ni ying-gai **duan-lian-duan-lian** ni-de shen-ti.
you should forge-forge-smelt-smelt your body
'You should exercise a bit.'

5.2.1 Syntactic Structure of AA-*you*-BB

Results of the *you*-insertion experiment revealed that the property of *you* 'and' as syntactic conjunction hinders its attachment to a root level node. This conforms to the proposed structure of the ABAB pattern, which predicts that morphemes with syntactic categories such as verb or noun cannot adjoin to a root node. The syntactic tree of the form AA-*you*-BB (Figure 5.2) illustrates that the conjunction *you* 'and' attaches to a phrasal node, which connects two verbal components at the intermediate level. The intermediate constituents V' are projected by two roots at the lowest level.

Figure 5.2 Syntactic structure of AA-*you*-BB



feng-feng-*you*-bu-bu
sew-sew-and-mend-mend
'sew and mend'

This structure predicts that:

1) *you* 'and' is optional and hence the AABB pattern (51a); Conjunctions are not obligatory; for example, they only occur at the end of lists. The AABB word does not require a conjunction, but when it occurs, it must be between AA and BB.

2) *you* 'and' cannot be attached to a root node, i.e., neither *feng-you-feng* nor *tiao-you-tiao* is grammatical (51b&c);

3) the two verbal components V' can be separated, i.e., *feng-feng* and *bu-bu* can be used alone 51d&e)[11];

4) when there is no copying of the morphemes, the form *feng-you-bu* should be acceptable.

51a. wo-de nai-nai xi-huan **feng-feng-bu-bu**
I-DE grandma like sew-sew-mend-mend
'My grandma likes sewing and mending.'

51b. ?ta ba na-tiao ku-zi **feng-*you*-feng**[12].
she BA[13] that-CL pants sew-and-sew
'She sewed that pair of pants.'

51c. ?ta bang wo **bu-*you*-bu** na-shuang wa-zi.
she help me mend-and-mend that-CL socks
'She helped me mend that pair of socks.'

[11] The expression of *bu-bu-you-feng-feng* is not acceptable due to the morpheme order of its base *feng-bu*.
[12] Although this could be predicted by the assumed structure, the insertion of the conjunction *you* into the AA (i.e., A-you-A) was not tested. The example is based on the author's intuition as a native speaker.
[13] BA= preposition/light verb

51d. zhe-tiao po niu-zai-ku **feng-feng** ke-yi ji-xu chuan[14].
this-CL ripped jeans sew-sew can continue wear
'This pair of ripped jeans can be worn again after sewing.'

51e. ma-ma, bang wo **bu-bu** zhe-shuang wa-zi.
mom help me mend-mend this-CL socks
'Mom, help me mend this pair of socks.'

51f. #ta ba na-tiao ku-zi **feng-*you*-bu**.
she BA that-CL pants sew-and-mend
'She sewed and mended that pair of pants.'

All predictions are verified by the examples in (51) except for the fourth one. As the sentence (51f) shows, the form A-*you*-B is in fact ungrammatical. However, this is not a counterexample to the proposed structure. Reduplicant morphemes contain the feature of pluractionality cross-categorically (Melloni & Basciano, 2014). In the case of the AABB pattern, pluractionality indicates the iteration of an action, i.e., 'to do something multiple times'. Naturally, when there is no reduplication on the base, the original verb *feng-bu* 'sew and mend' does not convey the plural meaning. As mentioned in the previous section, *you* 'and*'* indicates the repetition and continuation of actions and behaviours, which means that the insertion of *you* comes with restrictions. However, the non-reduplicated form, such as *feng-bu* does not meet the semantic requirement of being iterative. Hence, the form A-*you*-B is semantically unacceptable.

5.3 Deverbalization

In the 'AABB/ABAB object acceptability' test (e.g., 52), the results showed that speakers overwhelmingly feel that the ABAB pattern can take an object, whereas results from the AABB pattern were substantially more varied. This corroborates the previous findings that, unlike the ABAB pattern, the AABB pattern would be deverbalized to some extent.

52a. wo **yao-yao-huang-huang** shou li-de jiu ping.
I shake-shake-swing-swing hand inside-DE wine bottle
'I shook the bottle of wine in my hand.'

52b. wo-men **tao-lun-tao-lun** zhe-ge wen-ti ba.
We-plural discuss-discuss-discuss-discuss this-CL problem MP
'Let's discuss this problem a bit.'

[14] Examples 51d and 51f are from the experiment.

As shown by the test sentences below (53), the ABAB pattern can still take the object as the original base does. For example, both the base verb *xiao-liu* ‘exchange and communicate’ and its reduplication pattern *xiao-liu-xiao-liu* can take the object *xiang-fa* ‘idea’.

53a. hai-zi ying-gai chang he fu-mu **jiao-liu**
children should often with parents exchange-communicate

zi-ji-de xiang-fa.
myself-DE idea
‘Children should often share their ideas with their parents.’

53b. zan-men hu-xiang **jiao-liu-jiao-liu** xiang-fa.
I-plural each other exchange-communicate-exchange-communicate idea
‘Let’s exchange our ideas.’

53c. **xue-xi** bie-ren-de chang-chu shi hao shi.
study-study other-DE forte is good thing
‘It is good to learn the strengths of others.’

53d. ni dei **xue-xi-xue-xi** bie-ren-de chang-chu.
you need study-study-study-study other-DE forte
‘You need to learn the strengths of others.’

53e. ta ju-jue he wo **shang-liang** zhe-jian shi.
she refuse with I coordinate-negotiate this-CL matter
‘She refused to discuss this matter with me.’

53f. wo-men yi-qi **shang-liang-shang-liang** zhe-jian shi.
I-plural together coordinate-negotiate-coordinate-negotiate this-CL matter
‘Let’s negotiate this matter.’

On the other hand, participant responses varied as to whether the AABB pattern remains transitive as the variation between ‘YES’ and ‘NO’ was not obvious. But still, the number of negative judgments is higher than the positive ones, which indicates that, unlike the ABAB pattern, AABB is indeed deverbalized. For example, *tu-gai ‘alter’* is a transitive verb that can take a direct object such as *shi-juan* ‘test paper*’* (54a). When the base is reduplicated as *tu-tu-gai-gai*, it loses the ability to take an object as demonstrated by the test sentence (54b). Only when it is used as an intransitive verb can the sentence be grammatical (54c). Test sentences (54d-54f) also show that after reduplication, *tiao-tiao-xuan-xuan* ‘choose and pick repeatedly’ is unable to take the direct object *shang-pin* ‘product’.

54a. bu-yao **tu-gai** shi-juan.
not erase-alter test paper
'Do not alter the test paper.'

54b. *bu-yao **tu-tu-gai-gai** shi-juan.
not erase-erase-alter-alter test paper
'Do not alter the test paper.'

54c. bu-yao sui-bian **tu-tu-gai-gai** .
not randomly erase-erase-alter-alter
'Do not alter randomly.'

54d. ta zi-xi-de **tiao-xuan** shang-pin.
She careful-de choose-pick product
'she picked and chose products carefully.'

54e. *ta zi-xi-de **tiao-tiao-xuan-xuan** shang-pin.
She careful-de choose-choose-pick-pick product
'she picked and chose products carefully.'

54f. gu-zhu da ke **tiao-tiao-xuan-xuan**.
employer as much as possible can choose-choose-pick-pick
'The employers can pick whomever they want.'

5.3.1 Degree of Deverbalization

As mentioned in the literature review section, the degree of deverbalization often varies by verbs in different contexts. I take two verbs used in the experiment as examples to demonstrate this. *duo-duo-shan-shan* 'hide and dodge repeatedly' is an intransitive verb in (55a). It can also function as an adjective meaning 'evasive' with (55b) or without (55c) the prenominal modification marker *DE*. In other contexts, this word with the preverbal modification marker *de* transforms into an adverb meaning 'evasively' (55d). Another example is the word *yao-huan* 'shake; swing'. After reduplication, i.e., *yao-yao-huang-huang*, it is seldomly used as a verb in a sentence but often functions as an adverb meaning 'unsteadily'(55e&f). When the subject is a person, it describes a state of the person staggering around (55e) or to his/her feet (55f). It can also be an adjective meaning 'wobbly', which modifies the object *yi-zi* 'chair' it attaches to (55g). Therefore, even the same word is deverbalized to different degrees resulting in different categories across contexts.

55a. ta zai yan-cong hou-mian **duo-duo-shan-shan**.
he PREP chimney back hide-hide-dodge-dodge
'He dodged behind chimneys.'

55b. ta yi-fu **duo-duo-shan-shan**-de yang-zi
she one-CL hide-hide-dodge-dodge-DE look
'She looks evasive.'

55c. ta de hui-da zong-shi **duo-duo-shan-shan**.
he DE reply always hide-hide-dodge-dodge
'His reply is always evasive'

55d. 'wo bu zhi-dao', ta **duo-duo-shan-shan**-de da-dao.
I no know she hide-hide-dodge-dodge-de reply
''I don't know', she replied evasively.'

55e. ta **yao-yao-huang-huang**-de zou.
He shake-shake-swing-swing-de walk
'He walked unsteadily.'

55f. ta **yao-yao-huang-huang**-de zhan qi-lai.
She shake-shake-swing-swing-de stand up
'She stood up unsteadily.'

55g. wo zuo zai yi-ba **yao-yao-huang-huang**-de yi-zi shang.
I sit PREP one-CL shake-shake-swing-swing-DE chair upside
'I sit on a wobbly chair.'

5.3.2 Idiomatic Meaning of the AABB Pattern

A small portion of disyllabic verbs take on a figurative meaning after being reduplicated as the AABB pattern. This phenomenon is not found with the ABAB pattern because the activity denoted by ABAB is homogeneous to the base AB. For example, both *da-sao* and the reduplicated form *da-sao-da-sao* describes the activity of cleaning (56a&b). However, the activity denoted by AABB differs from the base. Two verbs used in the experiment can be used as examples to demonstrate this. For instance, the base verb *zhi-dian* originally means 'to point out the direction for someone' (56c), while the reduplicated form *zhi-zhi-dian-dian* describes an act of pointing figures at others (56d), which is often used as an idiomatic expression. *feng-bu* in (56e) originally means 'to sew and mend'. Apart from the literal sense, the reduplicated form also adopts a figurative meaning. The phrase in (56f) describes a situation where economically challenged people in a time of hardship have to wear worn-out clothes with patches for another three years. Thus, the phrase is often used to indicate the extreme poverty of poor households.

56a. wo zai **da-sao** fang-jian.
I PREP prefix-clean room
'I am cleaning the room.'

56b. wo **da-sao-da-sao** zhe-ge fang-jian.
I prefix-clean-prefix-clean this-CL room
'I clean the room a bit.'

56c. jing ta **zhi-dian** fang-xiang hou, wo zhao-dao-le
after he point-point direction after, I find-LE
ren-sheng-de mu-biao.
life-DE goal
'After he pointed out direction, I found the goal of life'

56d. bu-yao dui bie-ren **zhi-zhi-dian-dian**.
not PREP others point-point-point-point
'Don't point figures at others.'

56e. feng-bu yi-shang
sew-men clothes
'sew and mend clothes'

56f. feng-feng-bu-bu you san-nian
sew-sew-men-men again three year
'sew and mend for another three years'

5.3.3 Stative Adjectives

In the tests regarding the AABB pattern, it is found that the AABB pattern in our cases often transforms into adjectives even if the base is originally a verb. For example, in the experiment, *yao-yao-huang-huang* reduplicated from *yao-huang 'shake; swing'* behaves more like an adjective. It often describes a state of a person staggering around (55e) or to his/her feet (55f). In Mandarin, a large number of disyllabic verbs can be reduplicated as the ABAB pattern. In contrast, only a small number of verbs are available to be reduplicated as the AABB pattern because most of the AABB expressions are reduplicated from an adjective base. More specifically, AABB expressions are often regarded as stative adjectives, which are used to describe the state of things or actions (G. Zhang, 2007). Even for the AABB pattern with a verbal base, its grammatical nature will be closer to an adjective, mainly used as a modifier. According to Niu (2017), not all but some of the stative adjectives of the AABB pattern allow the modification by specific degree adverbs *you-xie*/*you-dian* meaning 'somewhat'. This also signifies the difference between the ABAB pattern and the AABB pattern. While the ABAB pattern that remains a verb cannot be modified by degree adverbs (57a&b), the adjective-like

quality of the AABB pattern enables the modification of such adverbs (57c&d) since only adjectives can be modified by degree.

57a. *ta **you-xie** da-sao-da-sao.
She somewhat prefix-sweep-prefix-sweep
'She somewhat cleaned.'

57b. *wo-men **you-xie** tao-lun-tao-lun.
I-Plural somewhat discuss-discuss-discuss-discuss
'We somewhat discussed.'

57c. ta-de yan shen **you-xie** duo-duo-shan-shan.
she-DE eye expression somewhat hide-hide-dodge-dodge
'Her eye expression is somewhat evasive.'

57d. ta **you-xie** tun-tun-tu-tu.
he somewhat swallow-swallow-spit-spit
'he is somewhat hesitant (to say).'

In conclusion, the ABAB pattern maintains transitivity and categorical stability while the result of the reduplicated AABB pattern is more complex due to different degrees of deverbalization across contexts and figurative interpretations found with part of the AABB expressions. Overall, the ABAB pattern does not exhibit deverbalization, while the AABB pattern does.

5.4 Decreasing/Increasing Function

5.4.1 Decreasing Function in Different Contexts

The results of the ABAB compatibility test with *hen-cuo-ci* 'many times' (e.g., 58) showed that the majority of the participants judged the pattern to be incompatible with 'many times', which suggests that the ABAB pattern is exhibiting a decrease in function.

58a. *ni ying-gai duan-lian-duan-lian shen-ti **hen-duo-ci**.
you should forge-forge-smelt-smelt body many times
'You should excise many times.'

58b. *ta jian-cha-jian-cha wo-de zuo-ye **hen-duo-ci**.
He examine-inspect-examine-inspect my homework many times
'He examined my homework many times.'

This decrease in function under different contexts may result in varied interpretations. In general, however, the narrowing in meaning is the essential attribute of verb reduplication of the ABAB pattern. This is supported by other research (e.g., Melloni & Basciano, 2018) who refer to this as 'diminishing reduplication'. Zhang (1979) holds that the ABAB pattern should be seen as the *'qing-wei'* type of verbs where *qing* 'light' indicates the lightness of action and *wei* 'micro' means little or short time. This is verified by the sample sentences above (58), where the pattern does not match 'many times'. In contrast, the adverb *shao-wei/shao-shao* 'a bit' is able to modify the ABAB pattern (59).

59a.	ni	**shao-shao**	xiu-xi-xiu-xi	ba.
	you	a bit	rest-rest-rest-rest	MP
	'You (should) rest a little bit.'			

59b.	zan-men	**shao-wei**	zheng-li-zheng-li	zhe-ge
	I-plural	a bit	organize-order-organize-order	this-CL
	fang-jian	ba.		
	room	MP		
	'Let's tidy this room a bit.'			

The ABAB reduplication is often regarded as a way of euphemistic expression of subjective desire. A speaker who suggests or requests in the form of verb reduplication would mitigate the degree of obligation of the speech act (Q. Li et al., 2017). Therefore, the pattern is often used in imperatives, as illustrated by the test sentence (60a). Moreover, in oral speech, the second syllable of the reduplicated verb is spoken softly to further relax the mood (Liu, 1983).

60a.	wo-men	yi-qi	shang-liang-shang-liang	zhe-jian	shi.
	I-plural	together	coordinate-negotiate-coordinate-negotiate	this-CL	matter
	'Let's negotiate this matter.'				

The use of the reduplicated form also enhances the degree of politeness to strengthen interpersonal harmony (Li, 2016). For example, the ABAB pattern with the occurrence of a modal verb in an interrogative sentence would make it easier for the other party to accept a request as illustrated by test sentence (61a). Sometimes, the pattern is also used to express modest and respectful attitudes especially when the other party is an authoritative figure (61b).

61a. ni neng bang wo da-ting-da-ting ta-de dian-hua
you can help I prefix-hear-prefix-hear her phone

hao-ma ma?
number MA
'Can you find out her phone number for me?'

61b. zhi-dian-zhi-dian
point-point-point-point
'point out the direction (give me some advice).'

5.4.2 Event-external Plurality of the AABB Pattern

The results of the test 'Is the AABB pattern compatible with *liang-ci* 'two times' (e.g., 62) showed a smaller difference between negative and positive judgments. However, this does not contradict the semantic effect of the increasing function of the AABB pattern.

62a. ta ba zhe-pian zuo-wen tu-tu-gai-gai **liang-ci**.
he BA that-CL essay erase-erase-alter-alter two times
'He altered the essay two times.'

62b. wo kan-jian ta jin-jin-chu-chu **liang-ci**.
I see him enter-enter-exit-exit two times
'I saw him enter and exit two times.'

According to Cusic (1981)), verbal plurality includes event-internal and event-external plurality based on a distinction between events and occasions. Examples (63) below illustrate that a person could go to the market two times on one occasion (a), which denotes internal plurality. A person may also go to the market one time on two separate occasions (b), which would denote external event plurality. An external type of event may happen on more than one occasion, and units of the event can be heterogeneous. The event-internal type indicates that an action should be performed only on one occasion, and units of such an action are homogeneous.

63. He went to the market twice.
(a)He went to the market two times that day.
(b)He went to the market once on Monday and Tuesday.

Deng (2013) follows this principle and further classifies the AABB pattern as the event-external type and that the repetition of an event can happen more than one time on one occasion or on separate occasions. This means for the AABB pattern, the event described by the base can happen a small number of times on different occasions. This may explain why a large number of participants judged 'two times' to be compatible with the AABB pattern. For instance, the test sentence (64a) indicates that the iteration of the event *fen-fen-he-he* 'break up and get back' is scattered across two separate occasions with each occasion including both the actions of *fen* 'break up' and *he* 'get back'. The same reading applies for the test sentence (64b) where the event *qi-qi-luo-luo* 'rise and fall' conveyed by the verb took place two times in different time periods. Unlike the AABB pattern, which involves two heterogeneous actions, e.g., *qi-luo* 'rise and fall', the base of the ABAB pattern only denotes one action on one occasion, e.g., *xiu-xi* 'rest' in (64c), and therefore is regarded as the event-internal type.

64a. wo ting-shuo ta-lia fen-fen-he-he **liang-ci**.
I hear they separate-separate-reconcile-reconcile two times
'I heard they broke up and got back two times.'

64b. wo-de ren-sheng qi-qi-luo-luo **liang-ci**.
my life rise-rise-fall-fall two times
'My life rose and fell apart two times.'

64c. ni gai hui-qu **xiu-xi-xiu-xi** le.
you should go-back rest-rest-rest-rest SFP

On the other hand, the event-external type of plurality also includes the situation where an event denoted by the base is distributed on a single occasion but for a large number of times. As shown by the test sentence (65a), the activity of 'alter the essay' denoted by the verb *tu-tu-gai-gai* was conducted on a single occasion, but the action took place repeatedly. The test sentence (65b) may describe a situation where a person saw a busy office employee enter and exit a building many times. The adverb *jin-tian* 'today' indicates that the event happened on one occasion but repeatedly.

65a. ta ba zhe-pian zuo-wen tu-tu-gai-gai **hen-duo-ci**.
he BA that-CL essay erase-erase-alter-alter many times
'He altered the essay many times.'

65b.	wo	kan-jian	ta	jin-tian	jin-jin-chu-chu	**hen-duo-ci**.
	I	see	him	today	enter-enter-exit-exit	many times

'I saw him enter and exit many times today.'

It may be difficult to determine what is meant exactly by 'multiple times' that the increasing function conveys. *liang-ci* 'two times' in our case may still be considered as multiple by participants because two is more than one, and the activity denoted by a verb is indeed repeated. The examples show that it is grammatical to match the AABB pattern with adverbs of a small number of times, such as 'three times'(66a) or 'more than one' (66b). Therefore, instead of saying the AABB pattern with the increasing function expresses the meaning of 'to do something multiple times', it is better to say, for the sake of conciseness, that the pattern indicates a repeated event with an increase in time and frequency compared to its base, and such an event may be distributed on one occasion or separate occasions. But still, in most cases, the AABB pattern cooccurs with adverbs of high frequency or longer duration. This can be verified by examples (67) below, which are found in the CCL (Centre for Chinese Linguistics) Corpus (Zhan et al., 2019). It is also more acceptable if *liang-ci* 'two times' is replaced with *hen-duo-ci* 'many times' in test sentences, as shown in (68f&g).

66a.	lai-lai-qu-qu	bu-zhi	yi-ci
	come-come-go-go	more than	one time

'come and go more than one time'

66b.	lai-lai-qu-qu	san-tang.
	come-come-go-go	three times

'came and went back three times'

67a.	**chang**	zai	yi-kuai-er	chi-chi-he-he
	often	PREP	together-ER	eat-eat-drink-drink

'often wine and dine together'

67a.	**yi-tian**	xia-lai,	jin-jin-chu-chu.
	one day	COMPL	enter-enter-exit-exit

'enter and exit the whole day'

67b.	feng-feng-bu-bu	you	**san-nian**
	sew-sew-men-men	again	three year

'sew and mend for another three years'

(Zhan et al., 2019)

68a. wo ting-shuo ta-lia fen-fen-he-he **hen-duo-ci**.
I hear they separate-separate-reconcile-reconcile many times
'I heard they broke up and got back many times.'

68b. wo-de ren-sheng qi-qi-luo-luo **hen-duo-ci**.
my life up-up-down-down many times
'My life rose and fell apart many times.'

5.5 Insertion of *le*

5.5.1 Sentential -*le* vs. Verbal -*le*

According to Soh & Gao (2006), there are two types of *le* in Mandarin Chinese, i.e., sentential -*le* and verbal -*le*. The former attaches to the end of a sentence, while the latter appears immediately after a verb. In this study, the morpheme *le* is annotated with two different markers, i.e., SFP and LE. SFP stands for 'sentence-final particle', which corresponds to sentential -*le* while LE refers to the perfective marker, which is equivalent to verbal -*le*.

Verbal -*le* indicates termination or completion of an event that a verb denotes. This can be verified by a simple test where the occurrence of a progressive marker *zai* with verbal -*le* would result in an ungrammatical sentence (69a). Sentential -*le* has more complex functions. When it attaches to a sentence where the event is denoted by a stative verb, it indicates a change of state. For instance, *le* in (69b) conveys that the person did not know the truth before, and hence there is a change of psychological being. It can also suggest the start of an activity (69c). In other situations, sentential -*le* has the same function as verbal -*le*, i.e., past meaning (69d). The inserted/attached *le* in our case is analyzed in the domain of verb reduplication and functions as a perfective marker. In other words, the focus of the section is verbal -*le*, and therefore sentential -*le* will not be discussed.

69a. *wo zai du-**le** yi-ben shu.
I PROG read-LE one-CL book
'I am reading a book.'

69b. ta zhi-dao zhen-xiang **le**.
he know truth SFP
'He knows the truth.'

69c. na wo zuo-fan **le**.
then I cook SFP
'I am about to cook then.'

69d. wo zuo-wan zuo-ye **le**
I finish homework SFP/LE
'I have finished homework.'

5.5.2 *le* with AABB

The result of the *le*-insertion test shows most of the participants judged that *le* should be attached to the end of the AABB pattern (70a). Few participants allowed *le* to be placed in the middle of the pattern (70b). Almost no participants permitted both positions for *le*. A small number of participants judged *le* to be incompatible with the pattern (70c). These findings corroborate previous findings that the perfective marker *le* should immediately follow the AABB pattern but cannot be inserted into the pattern (Deng, 2013; Melloni & Basciano, 2018; Xie, 2020).

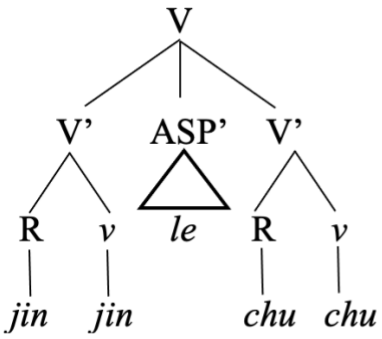
70a. ta feng-feng-bu-bu-**le** yi bei-zi.
she sew-sew-mend-mend-LE one life-suffix
'She sewed and mended the whole lifetime.'

70b. ta feng-feng-**le**-bu-bu yi bei-zi.
she sew-sew-LE-mend-mend one life-suffix
'She sewed and mended the whole lifetime.'

70c. ta feng-feng-bu-bu yi bei-zi.
she sew-sew-mend-mend one life-suffix
'She sewed and mended the whole lifetime.'

Now, this result seems to contradict the hypothesis. A possible structure derived from the proposed structure for the AABB pattern is the insertion of an aspectual marker that adjoins a syntactic level node. This structure predicts that *le*-insertion between AA and BB is syntactically grammatical, as shown by Figure 5.3 below.

Figure 5.3 Syntactic structure of *jin-jin-le-chu-chu*



jin-jin-*le*-chu-chu
enter-enter-LE-exit-exit
'entered and exited'

The placement of *le* between *jin-jin* 'enter-enter' and *chu-chu* 'exit-exit' will produce the form *jin-jin-le-chu-chu* (71). However, in the collected data, the sentence containing the expression *jin-jin-le-chu-chu* has 0% acceptability.

71.	*ta-de	jia-shu	jin-jin-**le**-chu-chu	yi-zheng-wan.
	she-DE	family	enter-enter-LE-exit-exit	one-CL-night
	'Her family went in and out (e.g., of the ward) the whole night.'			

The problem is that if *le* is a perfective marker, then it can only modify the entire event or action but not the units of it. As sentence (72a) shows, two actions (i.e., *ti-chu* 'propose'; *chan-shu* 'expound') are integrated by the conjunction *bing* 'and' into a single event 'propose and expound'. The aspectual marker *le* attaches to the end of the complex verbal phrase to modify the entire event. In contrast, *le* modifying part of the event will produce an ill-formed sentence (72b). Similarly, the AABB pattern describes an event involving two semantic units, i.e., AA and BB. Take *jin-jin-chu-chu 'enter-enter-exit-exit'* as an example (see the test sentence 73a), the event denoted by the pattern includes both the action of 'enter' and 'exit'. Hence, *le* would be required to occur at the end of BB under this semantic scope. Other forms of modification would be unacceptable (73b&c).

72a.	ta	ti-chu	bing	shan-shu-**le**	zhe	yi	xin	xue-shuo.
	he	propose	and	expound-LE	this	one	new	theory
	'He proposed and expounded the new theory.'							

72b. *ta ti-chu-**le** bing shan-shu zhe yi xin xue-shuo.
he propose-LE and expound this one new theory
'He proposed and expounds the new theory.'

73a. ta-de jia-shu jin-jin-chu-chu-**le** yi-zheng-wan.
she-DE family enter-enter-exit-exit-LE one-CL-night
'Her family went in and out (e.g., of the ward) the whole night.'

73b. *ta-de jia-shu jin-jin-le-chu-chu yi-zheng-wan.
she-DE family enter-enter-LE-exit-exit one-CL-night
'Her family went in and out (e.g., of the ward) the whole night.'

73c. *ta-de jia-shu jin-jin-le-chu-chu-**le** yi-zheng-wan.
she-DE family enter-enter-LE-exit-exit-LE one-CL-night
'Her family went in and out (e.g., of the ward) the whole night.'

5.5.3 *le* with ABAB

For the ABAB pattern, the results show that the option of 'insertion into the middle' (74a) and 'attachment to the end' (74b) show a similar number of positive judgments. A few participants considered both the insertion and the attachment of *le* to be acceptable. In contrast, a great number of participants judged neither the insertion nor the attachment of *le* to be acceptable (74c). In fact, *le*-insertion/attachment in the ABAB pattern is a controversial issue reported in the literature (Deng, 2013; Melloni & Basciano, 2018). This debate is reflected in the majority of people choosing 'neither' as their response, suggesting that they believe *le* is not compatible with the pattern at all.

74a. jin zao wo lian-xi-**le**-lian-xi na-shou ge.
today morning I practice-learn-LE-practice-learn that-CL song
'I practiced that song a bit this morning.'

74b. jin zao wo lian-xi-lian-xi-**le** na-shou ge.
today morning I practice-learn-practice-learn-LE that-CL song
'I practiced that song a bit this morning.'

74c. jin zao wo lian-xi-lian-xi na-shou ge.
today morning I practice-learn-practice-learn that-CL song
'I practiced that song a bit this morning.'

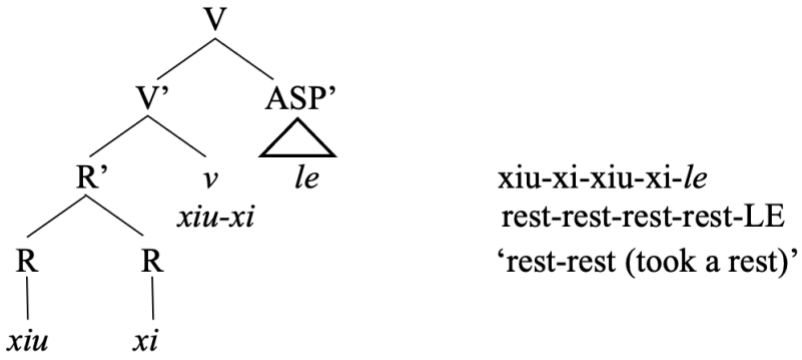
The operation of attaching *le* to the end of the pattern is possible based on the proposed structure (Figure 5.4). However, this option was not chosen by many participants. I will account for this

by contrasting the two patterns, i.e., AABB and ABAB. As mentioned earlier, for the AABB pattern, the base always describes an event involving two actions (e.g., *jin-chu* 'enter and exit'). Verbal -*le* should thus be immediately preceded by a verb and modify an entire event or action. This is demonstrated by examples below (75a&b), where *le* cannot be placed between *jin* 'enter' and *chu* 'exit'.

75a. jin-chu-**le** yi-zheng-wan.
enter-exit-LE one-CL-night
'went in and out the whole night.'

75b. *jin-**le**-chu yi-zheng-wan.
enter-LE-exit one-CL-night
'went in and out the whole night.'

Figure 5.4 Syntactic structure of *xiu-xi-xiu-xi-le*



le indicates completion of the event denoted by the base, while reduplication indicates such an event has been repeated for a period of time in the past. This process is illustrated by a flow chart below (Figure 5.5). The flow chart demonstrates that *le* should be placed immediately after an entire event/action is completed. In the case of the AABB pattern, the first half of the word (i.e., AA) only describes part of an event, and *le* is prohibited from inserting into the pattern. Therefore, *le* directly attaches to the end of AABB as merging with a verb phrasal node (Figure 5.6).

Figure 5.5 AABB with *le*: completion and reduplication

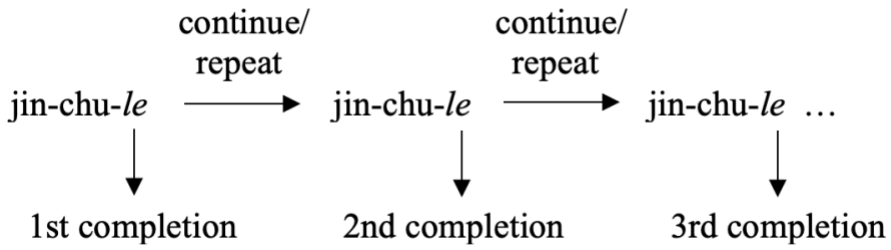
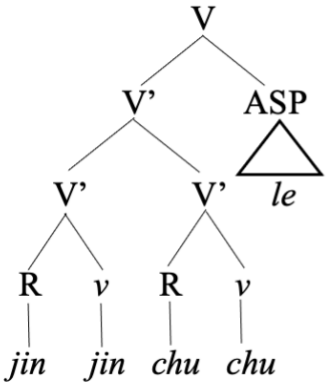


Figure 5.6 *le*-attachment of the AABB pattern



jin-jin-chu-chu-*le*
enter-enter-exit-exit-LE
'entered and exited'

Similarly, we can draw such a flow chart for the ABAB pattern marked by past tense (e.g., *xiu-xi-xiu-xi*) (Figure 5.7). The first half of the ABAB pattern is the base which already indicates a complete action. Therefore, *le* would be placed immediately after the base to meet the requirement of semantic interpretation, i.e., AB-*le*-AB. Now since a perfective marker cannot attach to a root level node, the operation of moving *le* under a functional head is not available. The other option is to move RED to a phrasal node, as shown in Figure 5.8. This structure will produce the correct surface order of AB-*le*-AB.

Figure 5.7 ABAB with *le*: completion and reduplication

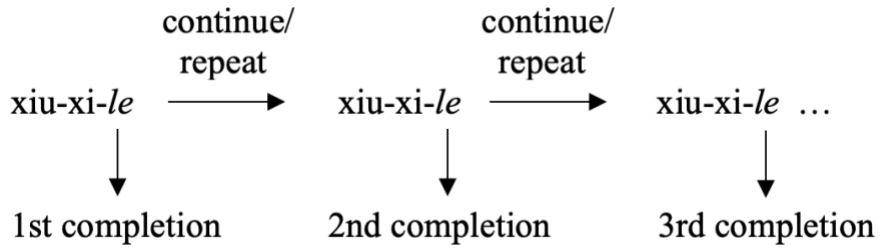
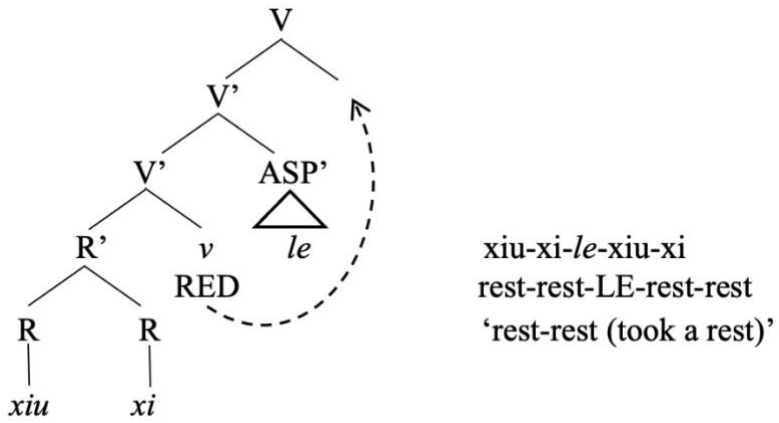


Figure 5.8 RED-movement of the ABAB pattern



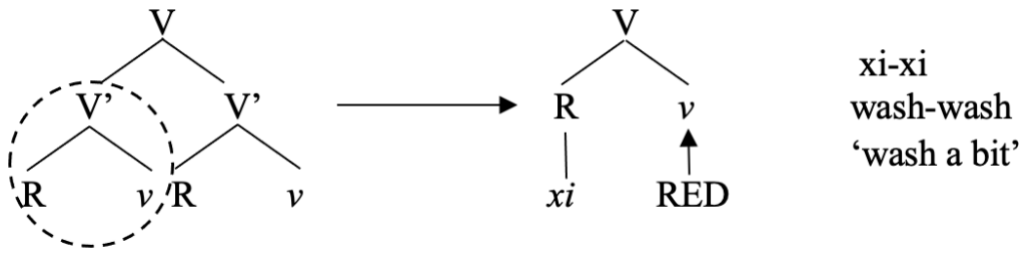
Note that the proposed structure of the ABAB pattern would allow *le*-attachment to the end of the pattern, but this projection is constrained by the semantic requirements of the perfective marker *le*. RED-movement would meet such requirements, but participants would take more time to process the operation in narrow syntax (see Section 5.7 Reaction time). This explains, to a certain extent, why participants seemed to tolerate both AB-AB-*le* and AB-*le*-AB, but with relatively low acceptability rates. This result indeed shows why it has been a controversial issue whether the perfective marker is compatible with the ABAB pattern (Deng, 2013; Melloni & Basciano, 2018).

5.5.4 A-*yi*-A vs. A-*le*-A

As mentioned in Section 5.1, the AABB reduplication is seen as the combination of two monomorphemic verb reduplications (i.e., AA reduplication). The proposed structures predict that the AA reduplication is a result of the reduplicant morpheme A taking the spot of the

categorizer, which is a null morpheme in non-reduplicated forms. As shown in Figure 5.9 below, the root *xi* 'wash' merges with a categorizer, and then the reduplicant morpheme replaces the null morpheme by copying the traits of the original root resulting in the AA pattern *xi-xi* 'wash-wash'.

Figure 5.9 Reduplicative process of *xi-xi* 'wash-wash'



The AA pattern has an alternative form A-*yi*-A, which is very common in discourse. This is not a counterexample of the hypothesis. The morpheme *yi* 'one' is often omitted in speech without causing any semantic effects. For example, (75a&b) show that the semantic interpretation of two sentences is consistent with or without the insertion of *yi*. Yet, the morpheme cannot be replaced by any other numerals such as *liang* 'two' (75c) and *san* 'three' (75d). This is because *yi* is not seen as a numeral quantifier here. In sentence (75e), *yi-hui* 'one time' is an adverb of number which modifies the action 'see a live performance'. In contrast, *yi-kan* 'one look' in (78f) does not count the number of looking. There is no difference in semantics between the phrase *kan-kan* 'look-look' and *kan-yi-kan* 'look-one-look'. This demonstrates differences in grammatical nature between *yi* 'one' and numerals with syntactic meaning. Therefore, in the domain of the AA reduplication, the morpheme *yi* 'one' is optional and does not have any concrete meaning. Deng (2013) holds the same view that the AA pattern and its alternative form A-*yi*-A only have prosody-induced differences. Zhang (2010) argues that *yi* 'one' plays the role of discourse marker, which does not count the action denoted by the base but emphasizes the shortness of time or frequency of the event.

75a. wo xi-xi zhe-xie yi-fu.
I wash-wash this-plural clothes
'I am washing these clothes.'

75b. wo xi-***yi***-xi zhe-xie yi-fu.
I wash-one-wash this-plural clothes
'I am washing these clothes.'

75c. *wo xi-***liang**-xi zhe-xie yi-fu.
I wash-two-wash this-plural clothes
'I am washing two times of these clothes.'?

75d. *wo xi-***san**-xi zhe-xie yi-fu.
I wash-two-wash this-plural clothes
'I am washing three times of these clothes.'?

75e. wo xiang kan-***yi***-hui xian-chang yan-chu.
I want look-one-CL live performance.
'I want to see a live performance one time.

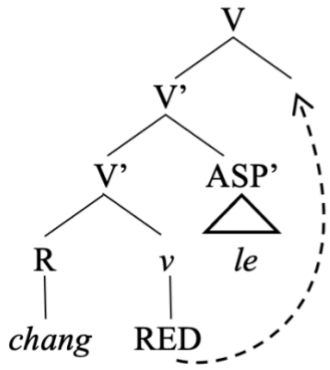
75f. wo xiang kan-(***yi***)-kan ni-de xin qun-zi.
I want look-one-look you-DE new dress
'I want to look (have a look of) your new dress.'

Another projection based on the hypothesis of the separability of the AABB structure is the A-*le*-A form. Unlike *yi* in the A-*yi*-A form, which only has phonological differences compared to the AA pattern, *le* does have syntactic function and semantic meaning indicating the completion of an event. For example, the AA pattern can be used in a situation where the action has not yet started (76a). The speaker has not tasted the food but is about to taste it. On the contrary, the A-*le*-A form always indicates that the action has been fulfilled, i.e., the person has already tasted it (76b). However, the reduplicative mechanism of the AA reduplication indicates that the insertion of any syntactic markers is not allowed since these markers can only attach to a syntactic level node. I propose, therefore, that A-*le*-A would follow the same rule as AB-*le*-AB (see Section 5.5.3), that is, a RED-movement in narrow syntax (Figure 5.10) to produce the correct order.

76a. wo chang-chang.
I taste-taste
'Let me taste it.'

76b. wo chang-le-chang.
I taste-LE-taste
'I tasted it.'

Figure 5.10 RED-movement of the AA pattern

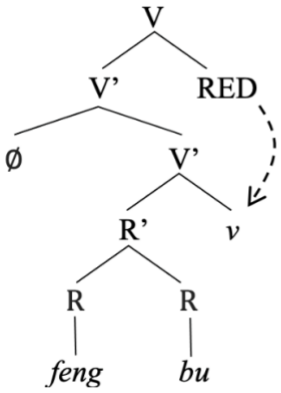


chang-*le*-chang
taste-LE-taste
'tasted a bit'

5.6 Alternative Structure for the AABB/ABAB Pattern

As mentioned in Chapter 2, Sang-Im and Lee-Kim (2016) argue that in the domain of adjective reduplication, a coordinate compound will go through morpheme lowering and morpheme copying to produce a correct surface form. They suggest that such operations are also available for verb reduplication. Although the base verb of the AABB pattern always has a coordinated structure, e.g., *feng* 'sew' and *bu* 'mend', their proposal fails to explain why the pattern can be separated. Figure 5.11 below demonstrates why this reduplicative process is not applicable to the AABB pattern. The two morphemes would merge together to form a higher root *feng-bu* 'sew-mend', which then adjoins to a categorizer *v*. RED originally attaches to a phrasal level node. Morpheme lowering moves RED under the functional head; and morpheme copying leads to an equal distribution of the reduplicant AB to both heads, i.e., A-RED and B-RED, hence the AABB pattern *feng-feng-bu-bu* 'sew and mend repeatedly'.

Figure 5.11 Morpheme lowering & copying



feng-feng-bu-bu
sew-sew-mend-mend
'sew and mend repeatedly'

Through this process, A-RED and B-RED would remain under a noncategorical root R'. This means any insertion of syntactic markers will be banned in that domain and that A-RED cannot be separated from B-RED. However, as shown by the results, both AA and BB are freestanding in a sentence (77a&b), and a large number of participants accepted the form AA-*you*-BB (78). Therefore, the assumed structure does not account for the separability of the AABB pattern.

77a. wo xiang chu-qu zou-zou.
I want out walk-walk
'I want to go out for a walk.'

77b. zan-men kan-kan shi xian dao.
I-plural see-see who first arrive
'Let's see who is the first to get there.'

78. hai-zi-men zai gong-yuan li beng-beng-you-tiao-tiao.
child-plural PREP park inside skip-skip-and-jump-jump
'Children skip and jump at the park.'

Another issue is that in the structure above, the two morphemes of the AABB pattern are merged to form a higher root, i.e., the base. However, as mentioned in Chapter 2, AABB does not always have a base. For example, *zou-zou-kan-kan* 'to walk and look around' (79a) has no such a base verb as *zou-kan* (79b). However, the word *zou-zou-kan-kan* is formed from two freestanding verbs, i.e., *zou* 'walk' and *kan* 'look; watch' (79c&d). This means, instead of merging two roots to form a base root, the two roots are supposed to project their own category.

79a. zou-zou-kan-kan
walk-walk-look-look
'walk and look around'

79b. *zou-kan
walk-look

79c. ta **zou**-le yi tian
he walk-LE one day
'He walked all day.'

79d. wo zheng-zai **kan** dian-ying
I PROG watch movie
'I am watching a movie.'

The same structure also cannot apply to the ABAB pattern. First of all, the base of the ABAB pattern can have various structures other than a coordinated one. However, the structure only provides an account for coordinate compounds. Second, even for a coordinate compound, the proposed structure will eventually project the order of AABB unless we prohibit the lowering and equal distribution of RED proposed in their study. Therefore, I conclude that this alternative structure (Figure 5.11) is not applicable to verb reduplication.

5.7 Reaction Time

The reaction time results show that, regardless of patterns, participants took a longer time for negative judgments than positive ones. This indicates that ungrammaticality in the syntactic/semantic domain hinders sentence comprehension and increases evaluation time.

In the *le*-insertion test, participants took less time to respond in the AABB task than the ABAB task. The AABB pattern does not allow the insertion but only the attachment of *le* (see Section 5.5.2). The ABAB task is more problematic with the responses of *le*-insertion and *le*-attachment evenly distributed. In particular, *le*-insertion is analyzed as a representation of RED-movement on the surface (see Section 5.5). Therefore, the ABAB pattern requires more complex syntactic operations with respect to *le*, which may cost participants more time to process. On the other hand, in the *you*-insertion test, the ABAB pattern rejects *you*-insertion while the AABB pattern allows it. Therefore, more time was needed for participants to judge the AA-*you*-BB form.

As for all the other tests, participants spent more time evaluating sentences constructed with the AABB pattern than those with the ABAB pattern. This may be due to the effect of deverbalization (see Section 5.3). The AABB pattern, under different semantic contexts, can

transform into different syntactic categories, especially adjectives. Moreover, a group of disyllabic words adopt a metaphorical meaning after being reduplicated as the AABB pattern. In contrast, the ABAB pattern remains as a verb with no idiomatic reading across contexts. Hence, adjective-likeness, as well as idiomatic usage of the AABB pattern, would require more time to reinterpret the semantic meaning.

5.8 Summary

This section is an in-depth discussion about the syntactic/semantic natures of the two patterns by answering the following questions:

1) Can AA or BB from the AABB pattern stand alone as a verb?

It is evident that AA or BB are freestanding as a verb in a sentence, which supports the proposal that each morpheme of the AABB pattern projects a verbal category. Also, the study found that AA or BB are not compatible with words that imply a meaning of large frequency or longer duration. The semantic interpretation of AA reduplication is the same as the ABAB pattern, i.e., decreasing function.

2) Is the insertion of *you* 'and' between AABB/ABAB acceptable?

The AABB pattern allows the insertion of the conjunction, while the ABAB pattern does not. In other words, the AABB pattern has higher separability than the ABAB pattern. *you* 'and' is therefore analyzed as adjoining to a phrasal node to connect AA and BB. Also, the structure of AA-*you*-BB predicts that A-*you*-B is syntactically possible when there is no RED-attachment. But the form is prohibited by the semantic constraints of the conjunction *you.*

3) Can AABB/ABAB (with a transitive base verb) take any object?

The AABB pattern loses the ability to take an object. It is found to be deverbalized to different degrees across contexts but in general, shows adjective-like quality. In contrast, the ABAB pattern maintains transitivity and categorical stability. Overall, the ABAB pattern does not exhibit deverbalization, while the AABB pattern does.

4) What are the semantic interpretations of the AABB/ABAB pattern?

The AABB pattern indicates a repeated event with an increase in time and frequency compared to its base, and such an event may be distributed on one occasion or separate occasions. In other words, the pattern shows increasing function, roughly translated as 'to do something repeatedly'. The ABAB pattern, on the contrary, shows a decrease in time and frequency, i.e., decreasing function, meaning 'to do something a bit'.

5) Is the perfective marker *'le'* (inserted in the middle/attached to the end) compatible with the AABB/ABAB pattern?

The proposed structure of the AABB patterns predicts that both the form AA-*le*-BB and AABB-*le* are syntactically possible. However, as a perfective marker, *le* only modifies an entire event/activity. Therefore, *le* attaching to the end of the pattern is grammatically and semantically predicted. This is also supported by the experimental results in that most participants chose the option AABB-*le*. In contrast, the first half of the ABAB pattern is the base which already indicates a complete action. Therefore, *le* would be placed immediately after the base to meet the requirement of semantic interpretation, i.e., AB-*le*-AB. This surface order is realized by moving RED to a phrasal node.

Note that the influence of dialect was not tested in this study. As mentioned in Chapter 2, there are dialects that can affect the acceptability of rhotacization. However, there is no clear evidence from previous findings that dialect has an impact on root compounding at an abstract level. There is little chance that dialect would affect the results except for the insertion of the perfective marker *le*. Because the results of the *le*-test are not as clear-cut as the other tests and the compatibility has been a controversial issue as mentioned before. Generally speaking, dialect might have more impact on the phonological surface rather than syntactic representation.

CHAPTER 6 CONCLUSION AND SUGGESTIONS

This study focuses on reduplicative processes of disyllabic verbs in Mandarin from syntactic perspectives. The two reduplicative patterns, AABB and ABAB, as well as their base states were discussed and explored from morphological, syntactic, and semantic perspectives. In particular, this study proposed two distinct syntactic structures for the two patterns reflecting the different behaviours of the two reduplication patterns. The AABB reduplication is regarded as concatenating two verbal constituents projected by each morpheme. Two reduplicant morphemes are analyzed as attaching to a lower-level root node. The ABAB pattern is seen as a result of copying the traits of the whole base. Two roots first merge to form a higher root, i.e., the base, and then RED adjoins to the higher-level root node to produce the correct order. In general, the proposed structures predict that the AABB pattern is breakable from the inside while the ABAB pattern is better viewed as a whole.

The results of an online experiment conducting a grammaticality judgment task and a fill-in-the-blank task showed that the two patterns are different in many aspects (see 6.1 major findings) and supported the proposed structures.

6.1 Major Findings

The AABB pattern is separable, supported by the ability of AA and BB to stand alone in a sentence and the ability to insert the conjunction *you* 'and' into the pattern. On the other hand, the ABAB pattern does not allow the insertion of *you* 'and'. In terms of transitivity, the ABAB pattern with a transitive base can still take a direct object. However, the AABB pattern loses transitivity and shows an adjective-like quality as a consequence of being deverbalized. Concerning semantic interpretations, the AABB pattern expresses intensified meaning with an increase in time or frequency of the event denoted by the base (i.e., increasing function). The ABAB pattern expresses an attenuated meaning with a decrease in time or frequency of the activity decried by the base (i.e., decreasing function). With respect to the perfective marker, *le* directly attaches at the end of the AABB pattern. The form AA-*le*-BB, though syntactically possible based on the hypothesis, is semantically unacceptable because the perfective marker only modifies the whole event but not part of it. The ABAB pattern with *le* is more variable since participants seemed to tolerate both attachment and insertion of *le* but with relatively low acceptability. The attachment of *le* is syntactically correct based on the prediction of the

proposed structure, while the insertion of *le* is analyzed as a result of RED-movement motivated by semantic constraints that *le* should immediately follow a completed action.

6.2 Suggestions for Future Research

6.2.1 Asymmetric Iteration

Any syntactic representation should cause semantic interpretative effects at the surface. In the case of verb reduplication in Mandarin, RED attaches to a root node during the reduplicative processes of AABB and ABAB. This operation results in plurality for both patterns, meaning the event denoted by the base is repeated. However, the plurality of the AABB pattern is not of the same kind as the ABAB pattern. Iteration of the AABB pattern comes with an intensified meaning, i.e., increasing function, whereases iteration of the ABAB pattern experiences semantic attenuation, i.e., decreasing function. Thus, an event of the AABB pattern is repeated with a longer duration or higher frequency than the ABAB pattern. Now, if attaching RED to a root node simply causes plural meaning, how can we explain asymmetric iteration between the two patterns?

A possible explanation is that the increasing or decreasing function depends on the number of times of RED-attachment. In the case of the AABB reduplication, we have RED attachment twice to a root node where each morpheme of the base gets copied. For the ABAB pattern, RED attaches only one time to a higher root to copy the traits of the whole base. If two-time RED-attachment could then correspond to the increasing function, and one-time RED attachment results in decreasing function. This also accounts for the reduplication of the AA pattern, which, same as ABAB, exhibits decreasing function as a result of one time of RED-attachment.

It is also possible that RED-attachment only causes plurality, and the increasing/decreasing function is attributed to other syntactic behaviour during the reduplicative process. But this will need further exploration of the syntactic nature of the two patterns.

6.2.2 Adjective Reduplication vs. Verb Reduplication

As discussed in previous chapters (see Section 5.6), syntactic structures of adjective reduplication are not applicable to verb reduplication. The proposed structures in this study do also not account for adjective reduplication. It is no doubt that there are similarities between verbs and adjectives. Both can be reduplicated as the AABB and ABAB pattern and attaching

RED cause plural meaning at LF. But the main problem is that there are different morphological and semantic requirements between adjective and verb reduplication.

In the case of verb reduplication, the base of the ABAB pattern is made of two roots with at least one of them being bound, and therefore the two roots are not separable; the base of the AABB pattern is a coordinated compound with each morpheme standing alone as a verb. However, the situation is reversed in the case of adjective reduplication. The base of adjectival ABAB is made of a head morpheme and a modifier morpheme, with the former being an adjective and the latter being a noun (Sang-Im & Lee-Kim, 2016). The two roots are not under the same node in the syntactic representation. The base of adjectival AABB is, although a coordinate compound, formed from two bound morphemes that are not separable. Concerning semantic effects, there is a distinction between increasing and decreasing functions in the case of verb reduplication. However, adjective reduplication of both the AABB and ABAB patterns indicates intensification.

With all these differences, a unified account for verb and adjective reduplication seems ill-advised. But the similarities between the two are worthy of exploring in the future.

6.2.3 Dynamic Process of Mandarin Reduplication

Finally, reduplication is a dynamic process that involves morphology, syntax, semantics, and phonology, with each module depending on the other. In this study, we have seen many properties of the patterns at the syntax-semantics interface, such as the *le*-attachment and RED-movement triggered by semantic constraints of the aspectual marker *le*. Therefore, there is no need to differentiate, for example, a morphological process from a syntactic one. Moreover, the fact that reduplication affects transitivity shows a clear syntactic effect. What matters is why the patterns show distinct behaviour and how layers of features and behaviour patterns are reflected during the reduplicative processes. It is hoped that this study, focusing on a syntactic account, may provide some insights for future research to explore this dynamic process of the reduplicative mechanism in Mandarin.

REFERENCES

Arcodia, G. F., Basciano, B., & Melloni, C. (2014). Verbal reduplication in Sinitic. *Proceedings of the 8th Décembrettes, 22*, 15–45.

Bach, E. (1986). The algebra of events. *Linguistics and Philosophy*, *9*(1), 5–16.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1), 1–48.

Chomsky, N. (1993). A Minimalist Program for Linguistic Theory. In K. Hale & S. K., Keyser (Eds). *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger* (pp. 1–52). Cambridge: MIT Press.

Cusic, D. (1981). *Verbal plurality and aspect* [Doctoral dissertation, Stanford University]. Retrieved from https://searchworks.stanford.edu/view/1012458

Deng, D. (2013). *The syntax and semantics of event quantifiers in Mandarin Chinese* [Doctoral dissertation, University of Wisconsin-Madsion]. Retrieved from https://eric.ed.gov/?id=ED564622

Deng, D. (2019). The syntax of Xihuan "to Like" in Mandarin and some related theoretical issues. *Contemporary Linguistics*, *21*(4), 515–530.

Dowty, D. (1979). *Word Meaning and Montague Grammar: The Semantics of Verbs and Times in Generative Semantics and in Montague's PTQ*. Springer Science & Business Media.

Dryer, M. S., & Haspelmath, M. (2013). *The world atlas of language structures online*. Max Planck Institute for Evolutionary Anthropology. Retrieved from http://wals.info

Erelt, M. (2008). Intensifying reduplication in Estonian. *Linguistica Uralica*, *44*(4), 268–277.

Guo, Z. (1987). Youguan "AABB" chongdieshi de jige wenti. *Hanyu Jiaoxue Yu Yanjiu*, *2*, 60–70.

Halle, M., & Marantz, A. (1993). Distributed morphology and the pieces of inflection. In K. Hale & S. K., Keyser (Eds). *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger* (pp. 111–176). Cambridge: MIT Press.

Halle, M., & Marantz, A. (1994). Some Key Features of Distributed Morphology. *MITWPL, 21*, 275–288.

Harley, H., & Noyer, R. (1999). State-of-the-Article: Distributed Morphology. *GLOT International*, *4*(4), 3–9.

Harley, H., & Noyer, R. (2003). Distributed Morphology. In L. Cheng (Eds). *The Second Glot International State of the Article Book: The Latest in Linguistics* (pp. 463–496). Berlin: Mouton de Gruyter.

Holmberga, A., & Wang, Q. (2018). Roots, categorizers and reduplication in Xining Chinese. In J. Emonds & M. Janebová (Eds). *Language Use and Linguistic Structure: Proceedings of the Olomouc Linguistics Colloquium* (pp. 183–201). Olomouc: Palacký University.

Hu, X. (2006). The grammaticalization of the reduplication form AABB. *Chinese Language Learning*, *4*, 18–25.

Hurch, B., & Mattes, V. (2007). The Graz Database on Reduplication. *Faits de Langues*, *29*(1), 191–202.

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2014). *lmerTest: Tests for random and fixed effects for linear mixed effect models* (R package version 2.0-11) [Computer software]. Cran.r Project.

Lee, E.-X. (2007). *Chinese nationals among "overseas Chinese" in Singapore: The sociolinguistic authentication of Mainland Chinese identities* [Doctoral dissertation,

University of Texas]. Retrieved from https://www.proquest.com/docview/304810972?pq-origsite=gscholar&fromopenview=true

Li, Q., Zhang, H., & Taguchi, N. (2017). The use of mitigation devices in heritage learners of Chinese. *Heritage Language Journal*, *14*(2), 150–170.

Li, Y. (2002). Dong ci chong die de ruo gan wen ti. *Zhongguo Yuwen*, *2*, 99 − 119.

Li, Y. (2016). *A Corpus-based study of politeness underlying duplication forms in Chinese* [Master's thesis, Northeast Normal University]. Retrieved from https://wap.cnki.net/touch/web/Dissertation/Article/10200-1016120158.nh.html

Lipták, A. (2019). Hungarian particle reduplication as local doubling. *Acta Linguistica Academica*, *66*(4), 527–574.

Liu, Y. (1983). Expressive function of verb reduplication and scope of reduplicatable verbs. *Studies of the Chinese Language, 1*(9).

Ma, Z. (1997). "V lai/qu" yu xian dai han yu dong ci de zhu guan fan chou. *Chinese Study*, *3*, 16–22.

Marantz, A. (1997). No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon. *University of Pennsylvania Working Papers in Linguistics*, *4*, 201–225.

McCarthy, J., & Prince, A. (1995). Faithfulness and reduplicative identity. In J. Beckman, L. Dickey, & S. Urbanczyk (Eds), *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory* (pp. 249–384). GLSA.

Melloni, C., & Basciano, B. (2018). Reduplication across boundaries: The case of Mandarin. In O. Bonami, G. Boyé, G. Dal, H. Giraudo & F. Namer (Eds), *The Lexeme in Descriptive and Theoretical Morphology* (pp. 325–363). Berlin: Language Science Press.

Nadarajan, S. (2006). A crosslinguistic study of reduplication. *Journal of Second Language Acquisition and Teaching, 13,* 39–53.

Niu, Y. (2017). *Xian dai han yu "cheng du fu ci+ zhuang tai xing rong ci" xian xiang fen xi* [Master's thesis, Henan University]. Retrieved from https://wap.cnki.net/lunwen-1017231295.html.

Packard, J. L. (2000). *The morphology of Chinese: A linguistic and cognitive approach*. Cambridge University Press.

Pankhurst, M. (2012). Rhotic lenition as a marker of a dominant character type in northern Mandarin Chinese. *Working Papers of the Linguistics Circle, 22*(1), 27–40.

Piechnik, I. (2015). Reduplicative syllables in Romance languages. *Romanica Cracoviensia, 15*(1), 30–55.

Qi, L. (2018). *A cognitive semantic study on Chinese reduplicate verbs in the form of AABB and ABAB* [Unpbulished Master's thesis, Nanjing Normal University].

Regier, T. (1994). *A Preliminary Study of the Semantics of Reduplication*. International Computer Science Institute.

Rothstein, S. (2004). *Structuring Events: A Study in the Semantics of Lexical Aspect*. Malden: Blackwell.

R Core Team. (2019). *R: A language and environment for statistical computing* [Computer software]. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/

Sang-Im & Lee-Kim. (2016). Syntax-based phonological asymmetries: The case of adjective reduplication in Mandarin Chinese. *Lingua, 179,* 1–23.

Soh, H. L., & Gao, M. (2006). Perfective aspect and transition in Mandarin Chinese: An analysis of double-le sentences. *The 2004 Texas Linguistics Society Conference*, 107–122.

Sproat, R., & Shih, C. (1996). A corpus-based analysis of Mandarin nominal root compound. *Journal of East Asian Linguistics*, *5*(1), 49–71.

Sui, Y. (2018). Affixation or compounding? Reduplication in Standard Chinese. In R. Finkbeiner & U. Freywald (Eds), *Trends in Linguistics: Vol. 323. Exact Repetition in Grammar and Discourse* (pp. 127-157). Berlin: Walter de Gruyter.

Travis, L. deMena. (2003). Reduplication feeding syntactic movement. In S. Burelle & S. Somesfalean (Eds), *Proceedings of the 2003 Annual Conference of the Canadian Linguistics Association*, 236–247. Ottawa: Canadian Linguistic Association.

Travis, L. deMena. (2001). The syntax of reduplication. *North East Linguistics Society*, *31*, 455–469.

Urbanczyk, S. (2017). Phonological and morphological aspects of reduplication. In *Oxford Research Encyclopedia of Linguistics*. Retrieved from https://doi.org/10.1093/acrefore/9780/99384655.013.80

Venables, W. N., & Ripley, B. D. (2013). *Modern applied statistics with S-PLUS*. Springer Science & Business Media.

Vendler, Z. (1957). Verbs and times. *The Philosophical Review*, *66*(2), 143–160.

Wang, J. (2017). Han yu chong qie yan jiu zong shu. *Modern Chinese*, *9*, 10–15.

Wu, F. X. (2010). Han yu fang yan li yu qu xiang dong ci xiang guan de ji Zhong yu fa hua mo shi. *Dialect, 2,* 97–113.

Xie, Z. (2020). Two Types of Verb Reduplications in Mandarin Chinese. *Studies in Chinese Linguistics*, *41*(1), 73–108.

Xiong, Z. (2010). *Modern Chinese two-syllable verb forms of overlapping observe and study* [Master's thesis, Northwest Normal University]. Retrieved from https://wap.cnki.net/lunwen-1011254961.html

Zhan, W. D., Guo, R., Chang, B., Chen, Y., & Chen, L. (2019). The building of the CCL corpus: Its design and implementation. *Corpus Linguistics*, *6*(1), 71–86.

Zhang, C. (2010). "V(yi)V" jie gou bu yi. *Journal of Hubei Normal University (Philosophy and Social Sciences)*, *6*, 30-32.

Zhang, G. (2007). Zhuang tai xing rong ci de jie ding he yu fa te zheng miao shu. *Linguistic Sciences*, *6*(1), 3–14.

Zhang, J. (1979). Lun han yu dong ci de chong die xing shi. *Journal of Zhengzhou University*, *3*, 15–24.

Zhang, N. N. (2007). Root merger in Chinese compounds. *Stud. Linguist, 61*, 170–184.

Zhang, X., & Liu, F. (2008). Investigation of verb-overlapping in contexts. *Academic Exchange*, *175*(10), 153–156.

APPENDIX

Test sentences used in the experiment

Part 1 Yes/No judgment task

- Can AA or BB from the AABB pattern stand alone as a verb (i.e., does verb reduplication of AA or BB make sense)?

1a. zhe-tiao po niu-zai-ku feng-feng ke-yi ji-xu chuan.
this-CL ripped jeans sew-sew can continue wear
'This pair of ripped jeans can be worn again after sewing.'

1b. ma-ma, bang wo bu-bu zhe-shuang wa-zi.
mom help me mend-mend this-CL socks
'Mom, help me mend this pair of socks.'

2a. ta zhi-shi sui-bian shuo-shuo.
she only randomly talk-talk
'She didn't mean what she said.'

2b. ta mian-qiang xiao-xiao.
he constrainedly laugh-laugh.
'He laughed constrainedly.'

3a. nv-hai-zi-men xi-huan tu-tu zhi-jia-you.
girl-plural like paint-paint nail polish.
'Girls like painting nails.'

3b. ni ying-gai gai-gai ni-de jina-li le.
you should change-change your resume SFP
'You should upgrade your resume.'

4a. ni chi-chi kan.
you eat-eat see
'Try this food and see.'

4b. wo ou-er he-he cha.
I sometimes drink-drink tea
'I drink tea sometimes.'

5a. wo xiang chu-qu zou-zou.
I want out walk-walk
'I want to go out to walk a bit.'

5b. zan-men kan-kan shi xian dao.
I-plural see-see who first arrive
'Let's see who is the first to get there.'

6a. ni neng qin-qin wo-de lian-jia ma?
you can kiss-kiss my cheek MA
'Can you kiss on my cheek?'

6b. bao-bao na-ge ke-lian-de hai-zi ba!
hug-hug that-CL poor-DE child MP
'Give that poor child a hug!'

7a. ta jian-ding-de yao-yao tou.
he determinedly shook-shook head
'He shook his head determinedly.'

7b. ta huang-huang shou li-de jiu ping.
he shook-shook hand inside-DE wine bottle
'He shook a bottle of wine in his hand.'

8a. neng shan-shan wo-de tai-ci ma, tai chang le.
can delete-delete my line MA too long SFP
'Can you cut my lines? They are too long.'

8b. wo gai jian-jian fei le.
I should lose-losefat SFP
'I should lose some weight.'

9a. wo xi-xi zhe-xie yi-fu.
I wash-wash this-plural clothes
'I am washing these clothes.'

9b. wo shua-shua zhe-shuang xie.
I brush-brush this-CL shoes
'I am washing this pair of shoes.'

10a. ta zhi-zhi ban-gong-zhuo shang-de yi-luo wen-jian.
she point-point desk upside-DE a-CL paper
'She pointed to a pile of papers on the desk.'

10b. ta zhi-hao dian-dian tou.
he only nod-nod head
'He could only nod.'

11a. ta qing-qing-de qiao-qiao men.
He gentle-de knock-knock door
'He tapped at the door.'

11b. wo ou-er da-da ping-pang-qiu.
I sometimes play-play ping pong
'I play ping pong sometimes.'

12a. zhe-ge mao-zi zhi neng zhe-zhe yang-guang.
this-CL hat only could block-block sunlight
'This hat could only block the sun.'

12b. ta yan-yan zui xiao le.
she cover-cover mouth smile SFP
'She covered her mouth and smiled.'

- Is the insertion of *you 'and'* between AA and BB acceptable?

13. wei-le jie-sheng qian, ta ba zhe-jian yi-shang
for save money she BA this-CL dress
feng-feng-you-bu-bu.
sew-sew-and-mend-mend
'She mended this dress many times to save money.'

14. wo-men shuo-shuo-you-xiao-xiao, kai-xin-de du-guo yi-tian.
I-plural talk-talk-and-laugh-laugh happy-de spend day
'We spend the time today, talking and laughing.

15. ta tu-tu-you-gai-gai que zhi-zhong bu man-yi.
he erase-erase-and-alter-alter but always not satisfied
'He altered many times but always felt unsatisfied.'

16. lv-xing jiu-shi chi-chi-you-he-he.
travelling is eat-eat-and-drink-drink
'The meaning of travelling is to discover tasty food.'

17. wo-men yan-zhe zhe-tiao lu zou-zou-you-kan-kan.
I-plural along this-CL road walk-walk-and-look-look.
'We walk and look around along the road.'

18. bu-yao zai gong-gong chang-he qin-qin-you-bao-bao.
not PREP public places kiss-kiss-and-hug-hug
'Do not make out in public places'

19. hai-zi-men zai gong-yuan li beng-beng-you-tiao-tiao.
child-plural PREP park inside skip-skip-and-jump-jump
'Children skip and jump at the park.'

20. na-dui qing-lv zong-shi fen-fen-you-he-he.
that-CL couple always separate-separate-and-reconcile-reconcile
'That couple break up and then get back over and over.'

21. ta zai lian shang tu-tu-you-mo-mo.
she PREP face surface smear-smear-and-wipe-wipe
'She smeared on her face.'

22. wo-men zong zai ren-sheng-de lu shang die-die-you-zhuang-zhuang.
I-plural always PREP life-DE road upside trip-trip-and-tumble-tumble
'We always stumble on the road of life.'

23. ai-qing zong-shi lai-lai-you-hui-hui.
love always come-come-and-go-go
'Love always comes and goes.'

24. ren-sheng bu jiu-shi qi-qi-you-luo-luo.
life not is up-up-and-down-down
'Isn't life full of ups and downs?'

- Can AABB (with a transitive base verb) take any object?

25. wo feng-feng-bu-bu zhe-tiao qun-zi.
I sew-sew-mend-mend this-CL dress
'I sew and mend this dress.'

26. bu-yao zhi-zhi-dian-dian bie-ren.
not point-point-nod-nod others
'Don't pointed figures at others.'

27. ta qiao-qiao-da-da na-kuan shi-tou.
he knock-knock-hit-hit that-CL rock
'He knocked and hit that rock.'

28. ta gou-gou-hua-hua yi-fu piao-liang-de tu.
he sketch-sketch-draw-draw that-CL beautiful-DE picture.
'He drew a beautiful picture.'

29. wo zai xi-xi-shua-shua can-ju.
I PROG wash-wash-brush-brush tableware
'I am washing dishes.'

30. ta la-la-che-che wo-de xiu-zi.
she pull-pull-drag-drag my clothes
'She tugged at my sleeve.'

31. wo yao-yao-huang-huang shou li-de jiu ping.
I shake-shake-swing-swing hand inside-DE wine bottle
'I shook the bottle of wine in my hand.'

32. ta duo-duo-shan-shan lai qiu.
he hide-hide-dodge-dodge coming ball
'he dodged the coming ball.'

33. bu-yao tu-tu-gai-gai shi-juan.
not erase-erase-alter-alter test paper
'Do not alter the test paper.'

34. wo-men mei you jie-kou tui-tui-tuo-tuo ze-ren.
I-plural not have excuse push-push-drag-drag responsibility
'We do not have excuses to pass the buck.'

35. ta zi-xi-de tiao-tiao-xuan-xuan shang-pin.
She careful-de choose-choose-pick-pick product
'she picked and chose products carefully.'

36. ta shi-tu zhe-zhe-yan-yan ta-de nian-ling.
She tend block-block-cover-cover her age
'she tended to hide her age.'

- Is AABB compatible with 'two times'?

37. ta ba zhe-jian qun-zi feng-feng-bu-bu liang-ci.
she BA this-CL dress sew-sew-mend-mend two times
'She mended this dress two times.'

38. wo-men shuo-shuo-xiao-xiao liang-ci.
I-plural talk-talk-laugh-laugh two times
'We talked and laughed two times.'

39. ta ba zhe-pian zuo-wen tu-tu-gai-gai liang-ci.
he BA that-CL essay erase-erase-alter-alter two times
'He altered the essay two times.'

40. ta zai jia li chi-chi-he-he liang-ci.
He PREP home inside eat-eat-drink-drink two times
'He ate and drank at home two times.'

41. ta zai ji-shi li zou-zou-kan-kan liang-ci.
he PREP market inside walk-walk-look-look two times
'He walked around in the market two times.'

42. na-ge hai-zi bei qin-qin-bao-bao liang-ci.
that-CL child BEI kiss-kiss-hug-hug two times.
'The child was kissed and hugged two times.'

43. ta zai bie-ren bei hou zhi-zhi-dian-dian liang-ci.
She PREP others back rear point-point-point-point two times.
'She spoke ill of others behind their back two times.'

44. che-liang lai-lai-wang-wang liang-ci.
cars come-come-go-go two times
'Cars come and go two times'

45. na-ge zei tou-tou-mo-mo liang-ci.
that-CL thief steal-steal-pilfer-pilfer two times
'That thief pilfered two times.'

46. wo kan-jian ta jin-jin-chu-chu liang-ci.
I see him enter-enter-exit-exit two times
'I see him enter and exit two times.'

47. wo ting-shuo ta-lia fen-fen-he-he liang-ci.
I hear they separate-separate-reconcile-reconcile two times
'I heard they broke up and got back two times.'

48. wo-de ren-sheng qi-qi-luo-luo liang-ci.
my life rise-rise-fall-fall two times
'My life rose and fell apart two times.'

- Is the insertion of *you 'and'* in the middle of ABAB acceptable?

49. wo-men tao-lun-you-tao-lun zhe-ge wen-ti.
I-plural discuss-discuss-and -discuss-discuss this-CL problem
'We discussed this problem again and again.'

50. ta da-sao-you-da-sao ta-de fang-jian.
she prefix-clean-and-prefix-clean her room
'She cleaned her room again and again.'

51. ni ying-gai duan-lian-you-duan-lian ni-de shen-ti.
you should forge-forge-and-smelt-smelt your body
'You should keep working out your body.'

52. wo-men shang-liang-you-shang-liang zhe-jian shi.
I-plural coordinate-negotiate-and-coordinate-negotiate this-CL matter
'We negotiated this matter again and again.'

53. wo xue-xi-you-xue-xi bie-ren-de chang-chu.
I study-study-and--study-study other-DE forte
'I keep learning strength from others.'

54. wo da-ting-you-da-ting ta-de dian-hua shao-ma .
I prefix-hear-and-prefix-hear her phone number
'I asked for her phone number again and again'

55. wo-men jiao-liu-you-jiao-liu bi-ci-de xiang-fa.
I-plural exchange-communicate-and-exchange-communicate mutual-DE idea
'We keep exchanging our ideas again and again.'

56. lao-shi jiao-yu-you-jiao-yu ta.
teacher teach-educate-and-teach-educate him
'The teacher lectured him again and again.'

57. bi-sai qian ta lian-xi-you-lian-xi zhe-shou ge.
competition PREP he practice-learn-and-practice-learn this-CL song
'He practiced the song again and again before the competition.'

58. wo-men yi-qi bu-zhi-you-bu-zhi na-ge fang-jian.
I-plural together arrange-place-and--arrange-place that-CL room
'We arranged the room together again and again.'

59. kuai jin wu li nuan-huo-you-nuan-huo shou.
quickly come house inside warm-suffix-and--warm-suffix hand
'Come in quickly and keep warming up your hands.'

60. ta an-mo-you-an-mo wo-de jian-bang.
she press-massage-and-press-massage my shoulder
'she kept massaging my shoulders.'

- Can ABAB (with a transitive base verb) take any object?

61. wo-men tao-lun-tao-lun zhe-ge wen-ti ba.
We-plural discuss-discuss-discuss-discuss this-CL problem SFP
'Let's discuss this problem a bit.'

62. wo da-sao-da-sao zhe-ge fang-jian.
I prefix-clean-prefix-clean this-CL room
'I clean the room a bit.'

63. ni ying-gai duan-lian-duan-lian shen-ti.
you should forge-forge-smelt-smelt body
'You should excise a bit.'

64. wo-men yi-qi shang-liang-shang-liang zhe-jian shi.
I-plural together coordinate-negotiate-coordinate-negotiate this-CL matter
'Let's negotiate this matter.'

65. ni dei xue-xi-xue-xi bie-ren-de chang-chu.
you need study-study-study-study other-DE forte
'You need to learn strength from others.'

66. ni neng bang wo da-ting-da-ting ta-de dian-hua hao-ma ma?
you can help I prefix-hear-prefix-hear her phone number MA
'Can you find out her phone number for me?'

67. zan-men hu-xiang jiao-liu-jiao-liu xiang-fa
I-plural each other exchange-communicate-exchange-communicate idea
'Let's exchange our ideas.'

68. ni duo jiao-yu-jiao-yu ta.
you more teach-educate-teach-educate him
'Educate him a bit more.'

69. bi-sai qian zai lian-xi-lian-xi zhe-shou ge.
competition PREP again practice-learn-practice-learn this-CL song
'Practice this song once again before the competition.'

70. wo-men yi-qi bu-zhi-bu-zhi fang-jian.
I-plural together arrange-place-arrange-place room
'Let's arrange the room together.'

71. kuai jin wu li nuan-huo-nuan-huo shou.
quickly come house inside warm-suffix-warm-suffix hand
'Come in quickly and warm up your hands.'

72. bang wo an-mo-an-mo jian-bang.
help I press-massage-press-massage shoulder
'Massage my shoulders please.'

- Is ABAB compatible with 'many times'?

73. wo-men tao-lun-tao-lun zhe-ge wen-ti hen-duo-ci.
We-plural discuss-discuss-discuss-discuss this-CL problem many times
'We discuss this problem many times.'

74. wo da-sao-da-sao zhe-ge fang-jian hen-duo-ci
I prefix-clean-prefix-clean this-CL room many times
'I clean the room many times.'

75. ni ying-gai duan-lian-duan-lian shen-ti hen-duo-ci.
you should forge-forge-smelt-smelt body many times
'You should excise many times.'

76. wo-men shang-liang-shang-liang zhe-jian shi hen-duo-ci.
I-plural coordinate-negotiate-coordinate-negotiate this-CL matter many times
'We negotiate this matter many times.'

77. wo xue-xi-xue-xi bie-ren-de chang-chu hen-duo-ci.
I study-study-study-study other-DE forte many times
'I learn from strength others many times.'

78. ta bang wo da-ting-da-ting ta-de hao-ma hen-duo-ci.
he help I prefix-hear-prefix-hear her number many times
'He looks for her phone number for me many times.'

79. ni xu-yao zheng-li-zheng-li ni-de fang-jian hen-duo-ci.
You need organize-order-organize-order your room many times
'You need to clean your room many times.'

80. ta jian-cha-jian-cha wo-de zuo-ye hen-duo-ci.
He examine-inspect-examine-inspect my homework many times
'He examined my homework many times.'

81. wo-de shi-fu jiao-xun-jiao-xun wo hen-duo-ci.
my master lecture-admonish-lecture-admonish I many times
'My master admonished me many times.'

82. wo-men qie-cuo-qie-cup qiu ji hen-duo-ci.
I-plural cut-scrub-cut-scrub basketball skill many times
'We have learned basketball skills from each other many times.'

83. ta an-pai-an-pai wo-men jian-mian hen-duo-ci.
he arrange-prepare-arrange-prepare I-plural meet many times
'He arranged us to meet many times.'

84. ta fen-xi-fen-xi zhe-dao shu-xue ti hen-duo-ci.
He differentiate-analyze-differentiate-analyze this-CL math problem many times
'He analyzed this math problem many times.'

Part 2 Fill-in-the-blank task

- Is the perfective marker 'le' (inserted in the middle/attached to the end) compatible with two patterns?

AABB:

1. ta feng-feng_bu-bu_ yi bei-zi.
she sew-sew-mend-mend one life-suffix
'She sewed and mended the whole lifetime.'

2. hai-zi-men beng-beng_tiao-tiao_ yi shang-wu.
child-suffix-plural skip-skip-jump-jump one morning
'Children skipped and jumped the whole morning.'

3. ta tiao-tiao_xuan-xuan_ yi zao-shang.
she select-choose-select-choose one morning
'She has selected (clothes/goods) for the whole morning.'

4. fu-qi-lia da-da_nao-nao_ yi bei-zi.
couple-plural fight-fight-quarrel-quarrel one life-suffix
'The married couple have fought and quarreled with each other for the whole life.'

5. ta-de jia-shu jin-jin_chu-chu_ yi-zheng-wan.
she-DE family enter-enter-exit-exit one-CL-night
'Her family went in and out (of the ward) the whole night.'

6. ta ba shi-juan tu-tu_gai-gai_ hen-duo-bian.
he BA test paper erase-erase-alter-alter many times
'He altered the test paper many times.'

7. zhe-dui qing-lv fen-fen_he-he_ hen-duo-bian.
this-CL couple separate-separate-reconcile-reconcile many times
'The couple broke up and then got back many times.'

8. niao-er-men ji-ji_zha-zha_ yi zao-chen.
bird-ER-plural chirp-chirp-twitter-twitter one morning
'Birds twittered the whole morning.'

9. ta da-da_sha-sha_ yi bei-zi.
he fight-fight-kill-kill one life-suffix
'He fought and killed people the whole life time.'

10. ta-lia shuo-shuo_xiao-xiao_ yi-jie ke.
he-plural talk-talk-laugh-laugh one-CL lecture
'They talked and laughed during the lecture.'

11. ma-ma zai zia li xi-xi_shua-shua_ yi zheng tian.
mom PROG home inside wash-wash-brush-brush one entire day
'Mom washed and brushed (did housework) the entire day.'

12. ta zai yuan di dou-dou_zhuan-zhuan_ hao-ji quan.
he PREP original place move-move-turn-turn many round
'He went around many times where he was.'

ABAB:

13. wo-men tao-lun_tao-lun_ zhe-ge wen-ti.
I-plural discuss-discuss-discuss-discuss this-CL problem
'We discussed this problem a bit.'

14. ta da-sao_da-sao_ zhe-ge fang-jian.
she prefix-clean-refix-clean this-CL room
'She cleaned the room a bit.'

15. wo gang-cai chu-men duan-lian_duan-lian._
I just now go outside forge-forge-and-smelt-smelt
'I went outside to exercise a bit just now.'

16. wo-men shang-liang_shang-liang zhe-ge shi.
I-plural coordinate-negotiate-coordinate-negotiate this-CL matter
'We negotiated this matter a bit.'

17. lao-shi gang-gang jiao-yu_jiao-yu_ ta.
teacher just now teach-educate-teach-educate him
'The teacher lectured him a bit just now.'

18. zhuan-jia-men jiao-liu_jiao-liu_ yi-jian.
expert-plural exchange-communicate-exchange-communicate idea
'Experts exchanged their ideas.'

19. ta gei bing-ren an-mo_an-mo_ jian-bang.
he give patient press-massage-press-massag shoulder
'He massaged the patient's shoulders a bit.'

.
20. ta da-ting_da-ting_ ta-de xiao-xi.
he prefix-hear-and-prefix-hear she-DE news
'He asked for her news.'

21. wo-men zuo-tian ba fang-jian bu-zhi_bu-zhi_.
I-plural yesterday BA room arrange-place-arrange-place
'We arranged the room a bit yesterday.'

22. jin zao wo lian-xi_lian-xi_ na-shou ge.
today morning I practice-learn-practice-learn that-CL song
'I practiced that song a bit this morning.'

23. ran-hou wo jiu jin wu li nuan-huo_nuan-huo_ shou.
then I just enter house inside warm-suffix-warm-suffix hand
'Then I came in and warmed up your hands.'

24. wo-men fen-xi_fen-xi_ yan-xia-de qing-kuang.
I-plural differentiate-analyze-differentiate-analyze current-DE situation
'We analyzed the current situation.